

Chemical Age

PLEA FOR
GREATER N, P, K
CONCENTRATION
(page 575)

VOL. 81 No. 2073

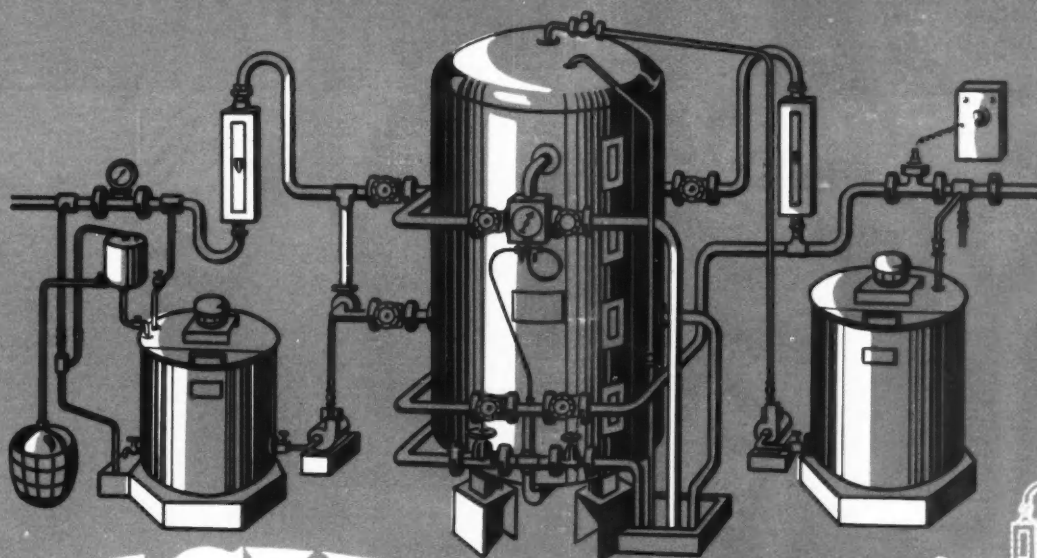
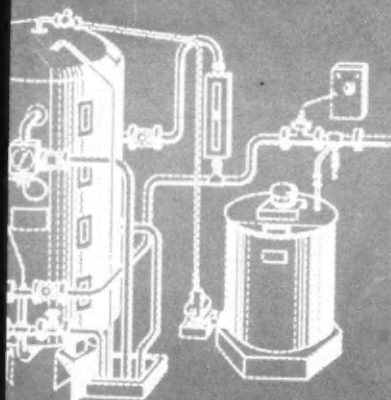
4 April 1959

PURE WATER

for Industrial purposes

ION EXCHANGE

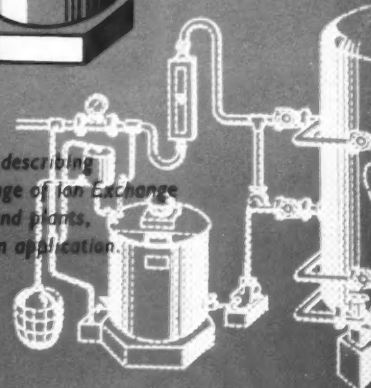
is the most up-to-date method of producing
pure water for all requirements, and it does
this at a fraction of the cost of distillation.

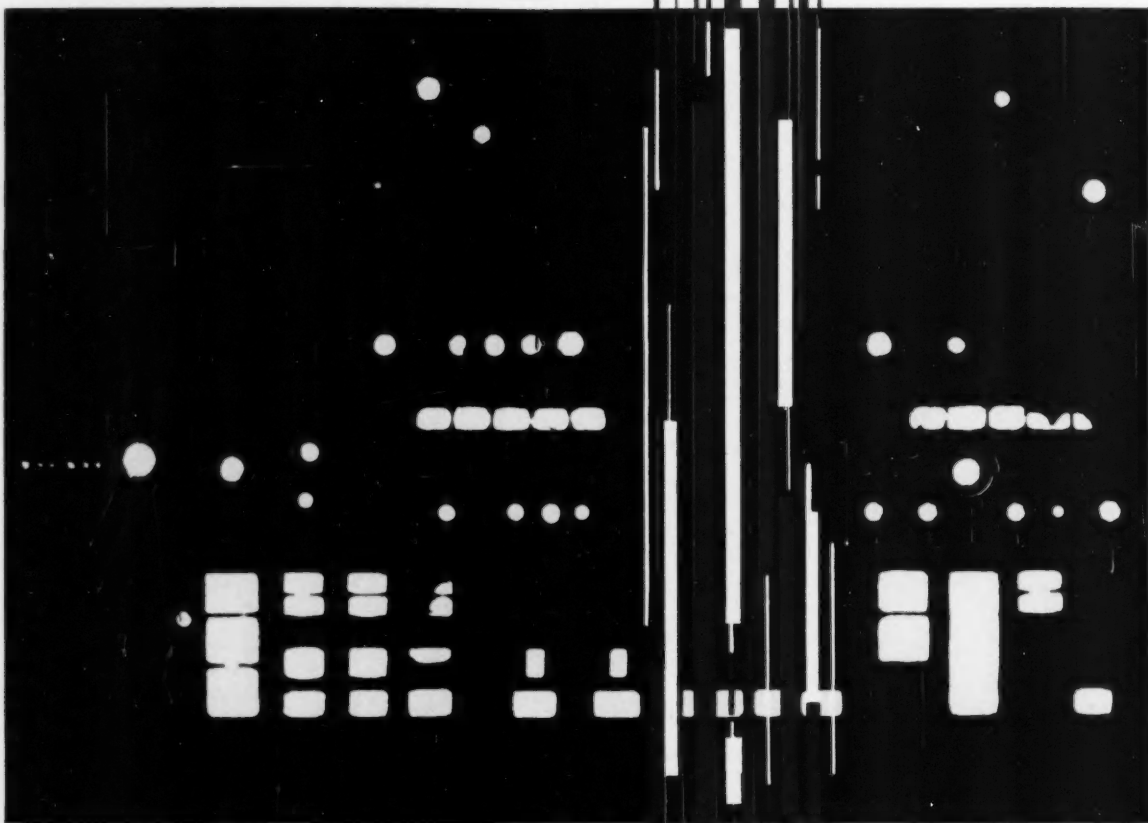


NECKAR

NECKAR WATER SOFTENER CO. LTD.
ARTILLERY HOUSE ARTILLERY ROW LONDON, S.W.1

Literature, describing
the full range of Ion Exchange
processes and plants,
available on application.



I.C.I. CARBON DIOXIDE GAS**FOR INDUSTRY**

I.C.I. supplies industry with high purity carbon dioxide in two forms:

For large users—

I.C.I. LIQUID CARBON DIOXIDE IN BULK is the cheapest method of buying carbon dioxide. There are no losses of residual gas, handling charges are eliminated, adequate stocks are easily maintained. Storage tanks of five-ton capacity are supplied by I.C.I. complete and ready for use, and I.C.I.'s rapid delivery service of liquid carbon dioxide means that vital work is never delayed.

For smaller users—

'DRIKOLD', solid carbon dioxide, and the 'DRIKOLD' LIQUEFIER give gas under pressure and ready for use. Only the net weight of carbon dioxide is handled—there's no heavy equipment to be lifted or moved. Once liquefiers are installed, pipelines remain connected—there is no coupling and uncoupling of lines. The liquefiers—usually supplied in pairs, to ensure continuity of gas supply—are simple to operate and each can give a discharge rate ranging from 8 cu. ft per minute to 70 cu. ft per minute. 100 lb of 'Drikold' will produce 875 cu. ft of gas measured at atmospheric temperature and pressure.

For both—

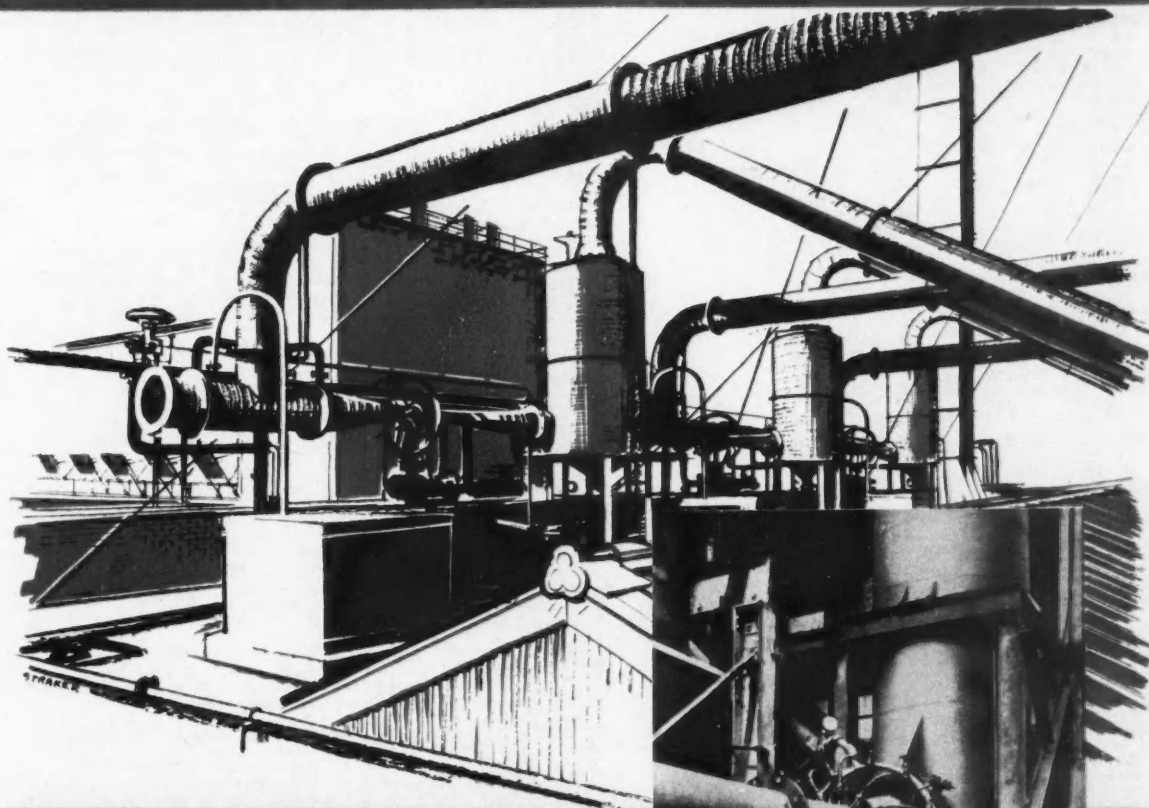
FULL TECHNICAL SERVICE is available. Help in the operation and maintenance of equipment and advice on all carbon dioxide problems is readily given.

Full information on request.

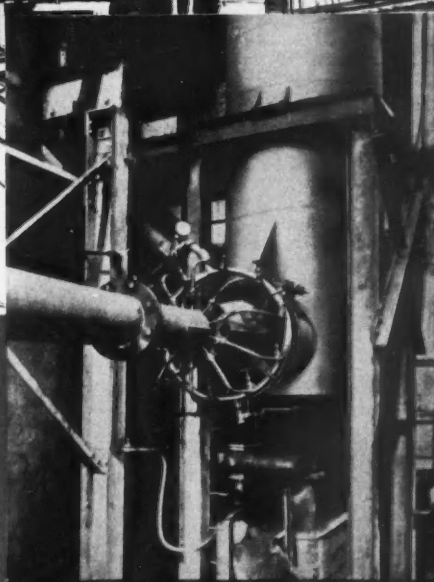
**IMPERIAL CHEMICAL INDUSTRIES LTD.,
LONDON, S.W.1**



For Removal of Micron and Sub-Micron DUST and MIST



P-A scrubber units are successfully removing dust and mist on blast furnaces, sintering plant, lime kilns, non-ferrous metal furnaces, spray dryers, superphosphate plants etc.



ADVANTAGES

High efficiency.
Low cost.
Low water requirements.
Low maintenance.



THE POWER-GAS CORPORATION LIMITED

ASSOCIATED WITH **ASHMORE, BENSON, PEARSE & COMPANY**

STOCKTON-ON-TEES AND LONDON

The first figures refer to advertisements in Chemical Age Directory & Who's Who, the second to the current issue

(continued on page 560)

AGENTS: DURHAM RAW MATERIALS LTD., 1-4 GREAT TOWER STREET, LONDON, E.C.3

in Standard and Superfine grades to meet most industrial requirements

AGENTS: DURHAM RAW MATERIALS LTD., 1-4 GREAT TOWER STREET, LONDON, E.C.3

PROTECTING CHEMICALS IS A JOB FOR PALFSACKS

Here is the solution to the everlastingly tricky problem of finding the right container for Chemicals. PALFSACKS, multi-wall paper sacks, provide the complete protection that is so essential: against contamination, against leaks, against weather, against dirt and vermin. PALFSACKS are literally tailor-made for the job because they are supplied with choice of linings, Polythene, Wax, Silicone, Bitumen and others, to keep your products pure. *And they are easy to handle and store into the bargain.* For full details of the complete PALFSACK range please write to the address below.



Not just paper sacks—but
PALFSACKS



WILLIAM PALFREY LTD., (Dept. C.A.),
Palfrey House, 24, City Road, London, E.C.1. Tel: MONarch 0681

INDEX TO ADVERTISERS

The first figures refer to advertisements in Chemical Age Directory & Who's Who, the second to the current issue

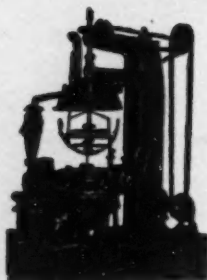
Page	Page	Page	Page	Page	Page
Interacence Publishers Ltd.	102	Monkton Motors Ltd.	91	Short & Mason Ltd.	
Isopad Ltd.	125	Monsanto Chemicals Ltd.		Siebe, Gorman & Co. Ltd.	
Jackson, J. G. & Crockett Ltd.		Moritz Chemical Engineering Co. Ltd.		Siemens Edison Swan Ltd.	
Jenkins, Robert, & Co. Ltd.		Mulberry Co., The		Sifam Electrical Instrument Co. Ltd.	
Jenkinson, W. G., Ltd.				Simon, Richard, & Sons Ltd.	
Johling, James A., & Co. Ltd.	571	82 Neckar Water Softener Co. Ltd.	Front cover	Sipon Products Ltd.	
Johnson, Matthey & Co. Ltd.		115 Negretti & Zambra Ltd.	563	Southern Instruments Computer Division	
Johnsons of Hendon Ltd.		New Metals & Chemicals Ltd.		Spencer Chapman & Messel Ltd.	568
		Newnes, George, Ltd.		Stabilag Co. Ltd., The	
		Nicolson, W. B. (Scientific Instruments)		Stanton Instruments Ltd.	
108 K.D.G. Instruments Ltd.		Ltd.		Stationery Office, Her Majesty's	
148 K.W. Chemicals Ltd.		Nitrate Corporation of Chile Ltd.		Staveley Iron & Chemical Co. Ltd.	
Kaylene (Chemicals) Ltd.		Nordac Ltd.		Steel, J. M., & Co. Ltd.	Cover iv
Kellie, Robert & Sons Ltd.				Steel & Cowlishaw Ltd.	
Kellogg International Corporation		146 Odoni, Alfred A. & Co. Ltd.		Stockdale Engineering Co. Ltd.	
Kernick & Son Ltd.		G/card Oil & Colour Chemists' Association		Stonehouse Paper & Bag Mills	
265 Kestner Evaporator & Engineering Co. Ltd.		Operation Britain		Streamline Filters Ltd.	
Kestner Evaporator & Engineering Co. Ltd.		136 Optical-Mechanical (Instruments) Ltd.		Sturge, John & E., Ltd.	
(Keebush)	592	Orr Products Ltd.		Sutcliffe Speakman & Co. Ltd.	
Kestner (Industrial Safety) Ltd.		Palfrey, William, Ltd.	559	Synthite Ltd.	
130 Kier, J. L., & Co. Ltd.		Pascall Engineering Co. Ltd., The			
King, G. W., Ltd.		8 Paterson Engineering Co. Ltd., The		149 "T.P." Chemical Engineering Co. Ltd.	
208 Kingsley & Keith Ltd.		161 Peabody Ltd.		155 Taylor Rustless Fittings Co. Ltd., The	570
184 Kleen-e-zee Brush Co. Ltd., The		Penrhyn Quarries Ltd.	592	142 Taylor Stainless Metals Ltd.	
		Permal Ltd.		152 Thermal Syndicate Ltd., The	
122 Laboratory Apparatus & Glass Blowing Co.		194 & 235 Permutit Co. Ltd., The	561	Thermo Plastics Ltd.	
224 Lambeth & Co. (Liverpool) Ltd.		G/card Petrocarbon Developments Ltd., The		Thompson, John (Dudley) Ltd.	
Langley Alloys Ltd.		Petrochemicals Ltd.		120 Titanium Metal & Alloys Ltd.	
112 Lankro Chemicals Ltd.		150 Plastic Filters Ltd.		Todd Bros. (St. Helens & Widnes) Ltd.	
205 Laporte Chemicals Ltd.	572	Platon, G. A., Ltd.		144 Towers, J. W., & Co. Ltd.	
114 Lavino (London) Ltd.		154 Podmores (Engineers) Ltd.		Triangle Valve Co. Ltd.	
173 Leda Chemicals Ltd.		206 Polyenco Ltd.		210 & 224 Tylors of London Ltd.	
96 Leek Chemicals Ltd.		223 Pool, J. & F., Ltd.			
Leas, Henry, & Co. Ltd.		Pott, Cassels & Williamson Ltd.		Unicone Co. Ltd., The	
112 Leigh & Sons Metal Works Ltd.	592	Potter, F. W., & Soar Ltd.		Unifloc Ltd.	
Lennig, Charles, & Co. (Great Britain) Ltd.		180 Powell Duffryn Carbon Products Ltd.		Unilever Ltd.	
Lennox Foundry Co. Ltd.		G/card Power-Gas Corporation Ltd., The	557	Union Carbide Ltd.	
129 Light, L., & Co. Ltd.		197 Prat-Daniel (Stannore) Ltd.		United Coke & Chemicals Co. Ltd.	570
135 Lind, Peter, & Co. Ltd.		128 Price Stutfield & Co. Ltd.		104 United Filters & Engineering Ltd.	
118 Liquid Solid Separations Ltd.		Price's (Bromborough) Ltd.		G/card Universal-Matthey Products Ltd.	
B/cover London Aluminium Co. Ltd., The		Prodorite Ltd.			
142 London Sand Blast Decorative Glass Works		Purkis, Williams Ltd.		Vacu-Blast Ltd.	
Ltd., The		Pye, W. G., & Co. Ltd.		Vaughan Crane Co. Ltd.	
Longman Green & Co. Ltd.		162 Pyrometric Equipment Co. Ltd., The		Voss Instruments Ltd.	
Longworth Scientific Instruments Co.		Q.V.F. Ltd.			
92 Lord, John L., & Son		Quickfit & Quartz Ltd.		183 W.E.X. Traders Ltd.	
Loughborough Glass Co. Ltd.				Walker, James, & Co. Ltd.	
McCarthy, T. W., & Sons Ltd		186 Reads Ltd.		Walker, P. M., & Co. (Halifax) Ltd.	
MacLellan, George, & Co. Ltd.		140 Rediwell Ltd.		Wallach Bros. Ltd.	
Maine, B. Newton Ltd.	564	Research Utilities Ltd.		105 Waller, George, & Son Ltd.	
126 Manesty Machines Ltd.		Reynolds & Branson Ltd.		98 Wallis, Charles, & Sons (Sacks) Ltd.	
177 Marchon Products Ltd.		Rheem Lysaght Ltd.		123 Ward, Thos. W., Ltd.	591
Marston Excelsior Ltd.		Richmond Welding Co. Ltd.		Warren-Morrison Ltd.	
108 Matthews & Yates Ltd.		Robinson, F., & Co. Ltd.	592	152 Watson, Laidlaw & Co. Ltd.	
Mav & Baker Ltd.		G/card Rose, Downs & Thompson Ltd.		Wellington Tube Works Ltd.	
Measuring & Scientific Equipment Ltd.		153 & 188 Dr. Rosin Industrial Research Co.		116 Wells, A. C., & Co. Ltd.	
Medway Paper Sacks Ltd.		Ltd.		220 Wengers Ltd.	
Mervyn Instruments & Co. Ltd.		124 Rotometer Manufacturing Co. Ltd.		Whessoe Ltd.	
Front cover Metal Containers Ltd		S.I.C. Plastics Ltd.		Whiffen & Sons Ltd.	
Metafiltration Co. Ltd.		118 S.P.E. Company Ltd.		184 Whitaker, B., & Sons Ltd.	
G/card Metalock (Britain) Ltd.		113 Sandiacre Screw Co. Ltd., The		123 Widnes Foundry & Engineering Co. Ltd.	591
126 Metcalf & Co.		Scientific Design Co. Inc.		202 Wilcox, W. H., & Co. Ltd.	
Metropolitan-Vickers Electrical Co. Ltd.		Scientific Glass-Blowing Co. Ltd.		136 Wilkinson, James, & Son Ltd.	
148 Middleton & Co. Ltd.		Scientific Instrument Manufacturers'		94 Williams & James (Engineers) Ltd.	
Mills Packard Construction Co. Ltd.		Association of Great Britain Ltd.		122 Wilson, Edward, & Son Ltd.	
Mine Safety Appliances Co. Ltd.		Scott, Ernest, & Co. Ltd.		114 Wood, Harold, & Sons Ltd.	568
Mirrlees Watson Co. Ltd., The		Scott, George, & Son (London) Ltd.		156 Worcester Royal Porcelain Co. Ltd., The	
140 Mirvale Chemical Co. Ltd., The		Sharples Process Engineers Ltd.		Worthington-Simpson Ltd.	
Mitchell, L. A., Ltd.		Shaw Petrie Ltd.		Wynn (Valves) Ltd.	
141 Mitchell Cotts Co. Ltd.		193 Shell Chemical Co. Ltd.		116 Yorkshire Tar Distillers Ltd.	
Mond Nickel Co. Ltd., The		Shell-Mex & B.P. Ltd.		106 Zeal, G. H., Ltd.	568

COPPER PLANT

for the CHEMICAL TRADE

STILLS
RECTIFYING COLUMNS
CONDENSERS

Autoclaves . Calandrias
Vacuum Pans . Boiling Pans
Pipework . Coils . Etc.



Steam jacketed copper Boiler and Mixer to tilt, with vacuum pump and jet condenser. Cover and agitator raised by bevel gear and hand-wheel

ESTABLISHED 1825
BLUNDELL & CROMPTON
LIMITED

WEST INDIA DOCK RD., LONDON, E.14.
Phone: East 3838 (3 lines). Grams: Blundell
1408 & 4160 Phone London

Decolorising

CARBON

ALL GRADE
FOR
ALL TRADES

HIGHEST EFFICIENCY
LOWEST PRICES

Granular Carbon for Solvent Recovery
Regeneration of Spent Carbon

Write for samples and quotations.

FARNELL CARBONS LIMITED
CONDUIT ROAD, PLUMSTEAD, LONDON, S.E.18

Telephone:
Woolwich 1158 (2 lines)

Telegrams:
Scafcar, Wol, London

ION EXCHANGE RESINS FOR CHROMATOGRAPHY

By **Permutit**

A complete range of "Zeo-Karb 225" and "De-Acidite FF" ion exchange resins for chromatographic separations and other analytical purposes is now being produced by The Permutit Company Ltd. A new production unit has been established especially for this purpose. Details of the resins are as follows:—

"ZEO-KARB 225"

% DVB.	Water Regain grams of water per gram of Na resin	PARTICLE SIZES
1	6-12	14-52, 52-100, 100-200, < 200
2	3-5	14-52, 52-100, 100-200, < 200
4.5	1.5-2	14-52, 52-100, 100-200, < 200
8	0.9-1.1	14-52,* 52-100, 100-200, < 200
20	0.4-0.6	14-52, 52-100, 100-200, < 200

*Standard "Zeo-Karb 225"

"DE-ACIDITE FF"

Water Regain grams of water per gram of Cl resin	PARTICLE SIZES
1.6-2.0	14-52, 52-100, 100-200
1.0-1.5	14-52,* 52-100, 100-200, < 200
0.6-0.9	14-52,** 52-100, 100-200, < 200

*Standard "De-Acidite FF" type 510

**Standard "De-Acidite FF" type 530

The crosslinking of "Zeo-Karb 225" cation exchange resins is given in terms of nominal weight percentage of divinylbenzene in the hydrocarbon polymer. The corresponding weight swelling or water regain is also given.

Only the weight swelling, or water regain, is specified for the "De-Acidite FF" because extra

crosslinks, in addition to those originally placed in the hydrocarbon structure, are introduced during manufacture. It is thus not possible to produce "De-Acidite FF" in as wide a range as "Zeo-Karb 225" because materials with very high water regain are difficult to manufacture reproducibly.

For further details please write to:—

THE PERMUTIT COMPANY LIMITED

Dept. V.A. 299 . Permutit House, Gunnersbury Avenue, London, W.4 . Telephone: CHLswick 6431



CHEMICALS?

*-just
a 'phone call away*

Eminently sound sense to get in touch with Cyanamid first. Cyanamid have the vast resources to supply a very wide range of industrial chemicals.

Chemicals for plastics, surface coatings, paper, textiles, soap and detergents, leather, the wood using industries, pharmaceuticals, adhesives, and lubricating oils together with a wide variety of new products for miscellaneous applications — Cyanamid supplies them all and backs them with a specialized technical advisory service.

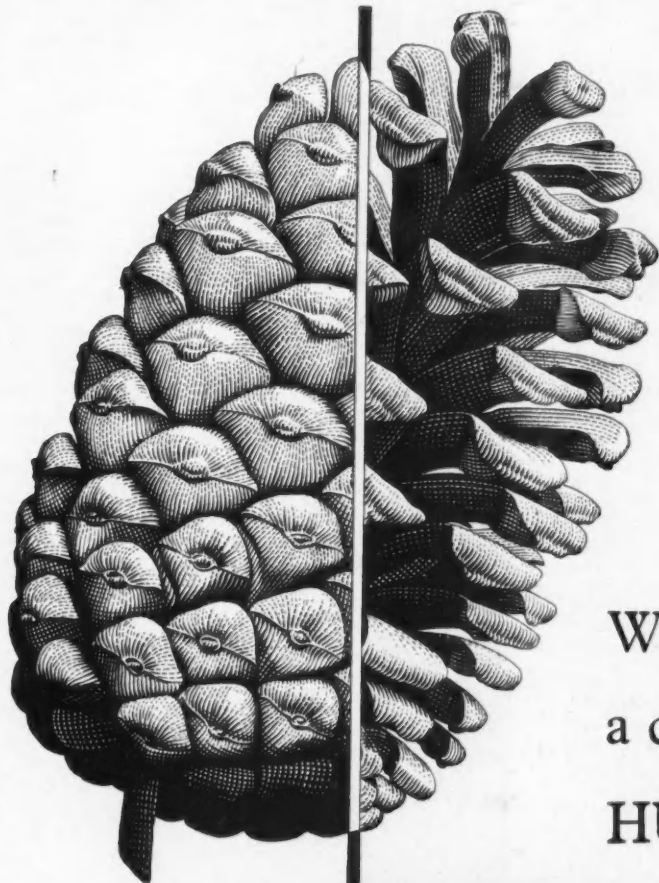


CYANAMID OF GREAT BRITAIN LTD.
GENERAL CHEMICALS DIVISION
BUSH HOUSE LONDON W.C.2.

TEMPLE BAR
5411

CYANAMID

First-class industrial chemicals backed
by a first-class advisory service



When it's
a question of
HUMIDITY

consult . . .

NEGRETTI & ZAMBRA

*Manufacturers of instruments for the
indication, recording, controlling of:—
Temperature, pressure, liquid level, volume,
specific gravity, humidity, etc. Also
meteorological and aircraft instruments.*

NEGRETTI & ZAMBRA LIMITED,
122 REGENT STREET, LONDON, W.1

Telephone: REGent 3406. Telegrams: Negretti, Piccy, London.

BRANCHES: Birmingham, Cardiff, Glasgow, Leeds, Manchester, Nottingham.
Agents or Subsidiaries in most countries.

B. NEWTON MAINE LTD

Lloyds Bank Bldg, Letchworth

Letchworth 2140

FOR RARE CHEMICALS

with emphasis on substances produced by HIGH PRESSURE HYDROGENATION

AMINO ACIDS BIOCHEMICALS GLYCOSIDES PEPTIDES PURINES SACCHARIDES

1, 4 (bis-Aminomethyl)-cyclohexane
Azelaic acid derivatives
Arachyl alcohol
Behenyl alcohol
Butene-2-diol-1:4 (electroplating use excluded)
Chalcone and Derivatives
Choline base & compounds
Cyclodecanol
Cyclodecanone
Cyclodecane
Cyclodecyl halides
Cyclodecylamine
Cyclodecyl urea
Cyclododecanol
Cyclododecanone
Cyclododecane
Cyclododecyl bromide & chloride
Cyclododecylamine
Cyclododecyl urea
Cycloheptyl urea
Cyclohexyl urea
Cycloheptane
Cycloheptanol
Cycloheptanone
Cycloheptyl bromide & chloride
Cycloheptylamine
Cyclononane
Cyclononanol
Cyclononanone
Cyclononyl halides
Cyclononylamine
Cyclononyl urea
Cyclooctane
Cyclooctanol
Cyclooctanone
Cyclooctyl halogenides
Cyclooctylamine
Cyclooctyl urea
Cyclopentanol
Cyclopentanone
Cyclopentylamine
Cyclopentyl bromide & chloride
Cyclopentyl urea
Cycloundecane
Cycloundecanol
Cycloundecanone
Decahydroquinoline (cis & trans)
Decamethylene dinitrile
Decanediol-1:10
1, 5-Diaminopentane
1, 7-Diaminoheptane
4, 8-Diaminooctane
1, 9-Diaminononane
1, 10-Diaminodecane
1, 11-Diaminoundecane
1, 12-Diaminododecane
1, 13-Diaminotridecane
1, 5-Dibromopentane
1, 6-Dibromohexane
1, 7-Dibromoheptane
1, 8-Dibromooctane
1, 9-Dibromononane
1, 10-Dibromodecane
1, 11-Dibromoundecane
1, 4-Dibromobutene-2
1, 7 (2:8) Dibromooctane
2, 5-Dibromohexane
1, 6-Dichlorohexane
1, 7-Dichloroheptane
1, 8-Dichlorooctane
1, 9-Dichlorononane
1, 10-Dichlorodecane
1, 4-Dichlorobutene-2
2, 5-Dichloro-hexene-3
2, 5-Dichlorohexane
2, 3-Dichloro-1, 4-naphthoquinone
Dicycloheptylamine
1, 4-Dicyclohexanoly diacetylene
Dicyclooctylamine
Dicyclopentadienyliron
Dicyclopentylamine
Dicyclohexanolybutane
Dihydromucodinitrile

Dihydrofuran
1, 8-Diiodooctane
Dimercaptopropanol redistilled
1, 8-Dimethoxyoctane
1, 8-Dimethoxyoctadien-1, 7-diene-3, 5
Dimethyl brassylate
2, 5-Dimethyltetrahydrofuran
Dimethyl thapsate
N,N-Dimethylaminoglycerol
2, 5-Dimethylpyrrolone
Dimethyl dodecamethylene dicarboxylate
3, 8-Dimethyloctanediol-2, 7
2, 7-Dimethyloctadiene-3, 5-diol-2, 7
3, 8-Dimethyldodecanediol-3, 8
3, 8-Dimethyldodecadiene-4, 6-diol-3, 8
2, 5-Dimethyl pyrrole
1, 6-Dimorpholinyl-hexadiene-2, 4
Dodecandioic acid dimethylate
Heptanediol-1, 7
Heptamethylene dinitrile
n-Heptadecyl alcohol
n-Heptadecanoic acid nitrile
Heneicosylic acid
Heptadecylic acid
Hexanediol-1, 6
Heneicosylic alcohol
Hexanediol-2, 5
n-Heneicosanoic acid nitrile
Hexadecanediol-1, 16
Hexamethylene dinitrile
Hexahydro- β -xylidiamine
Hexadiene-2, 4-diol-1, 6
beta-Hydroxyethylmorpholine
Hexene-3 diol-2, 5
Isobutylene stabilized
Lauryl chloride (96%)
Lauryl iodide
Margaronitrile
beta-Mercaptoethylamine HCl;
5-Methoxy-1-chloropentene-2
1-Methoxybuten-1-in-3
5-Methoxy-3-chloropentene-1
3-Methylheptanediol-2, 4
3-Methyl-5-ethylheptanediol-2, 4
3-Methylpentanediol-2, 4
3-Methyl-5-ethylnonanediol-2, 4
2-Methyltetrahydrofuran
1-Methyl-1, 2, 3, 4-tetrahydroquinoline
4-Methyltetrahydropyran
2-Methyl-1, 2, 3, 4-tetrahydroisoquinoline
n-Nonadecylic alcohol
Nonadecylic acid
Nonamethylene dinitrile
n-Nonadecanoic acid nitrile
Nonanediol-1, 9
Octamethylene dinitrile
Octanediol-1, 8
n-Pentadecyl alcohol
Pentadecylic acid
Pentadecandioic acid dimethylate
Pentamethylene dinitrile
n-Pentadecanoic acid nitrile
Pentadecanediol-1, 15
Pimelic acid
Pivalic acid
Pyrrolone
trans-Stilbene
Suberic acid
Serotonin creatinine sulphate
Tetradecandioic acid dimethylate
1, 2, 3, 4-Tetrahydroisoquinoline
1, 2, 3, 4-Tetrahydroquinoline
Tetrahydropyran
Tetradecanediol-1, 14
Tridecyl acid
Thapsic acid
Tridecyl alcohol
n-Tridecanoic acid nitrile
Triacosylic acid
n-Triacosylic alcohol
n-Triacosanoic acid nitrile
Tridecandioic acid dimethylate
Undecanediol-1, 11
Undecandioic acid dimethylate
Undecamethylene dinitrile



Alkimia

In the eighth century A.D., when monasteries in Britain offered only a classical education to a selected few, the advancement of science rested, in large measure, with the Arab peoples. One of the greatest of Arab alchemists, Abu Musa Jabir ibn Hayyan — known to the West as Geber — first experimented with a man-made “catalyst”, namely sulphuric acid to produce ether from alcohol.

Today, man-made catalysts, carefully controlled at every stage of production, are essential in many branches of industry. And the I.C.I. range of catalysts is well known and widely used in heavy chemical, petroleum chemical, and petroleum refining processes.

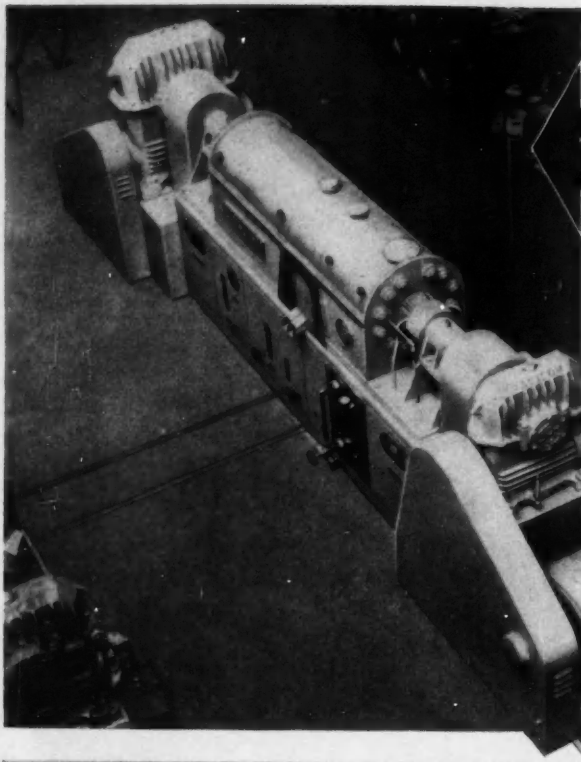
Full information on I.C.I. CATALYSTS is available on request.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.



B.268

TWO OF A BRILLIANT RANGE



THE *Baker Perkins* REACTOR

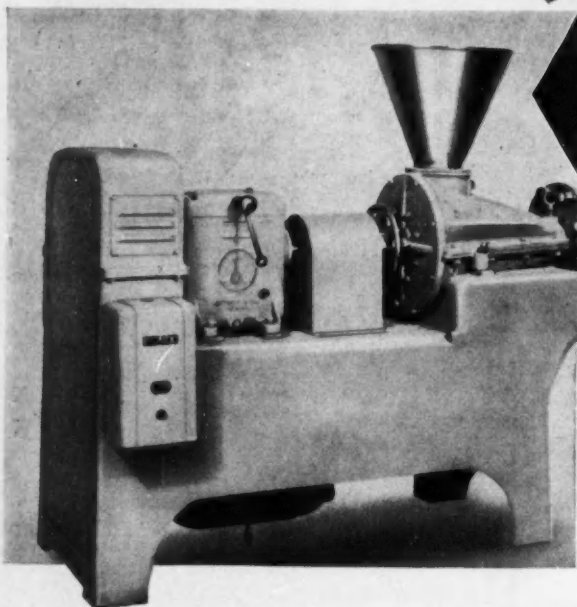
**A Continuous Mixer
with Heat Exchange for**

EMULSION POLYMERISATION

SYNTHETIC FIBRE DOPE PREPARATION

SOAP WASHING

GLYCEROL EXTRACTION



THE *Baker Perkins* ROTOFEED

**A Continuous Mixer-
feeder for handling**

DOUGHS, PASTES, SLURRIES

AND RESINOUS DOPES FROM

METERED SOLIDS

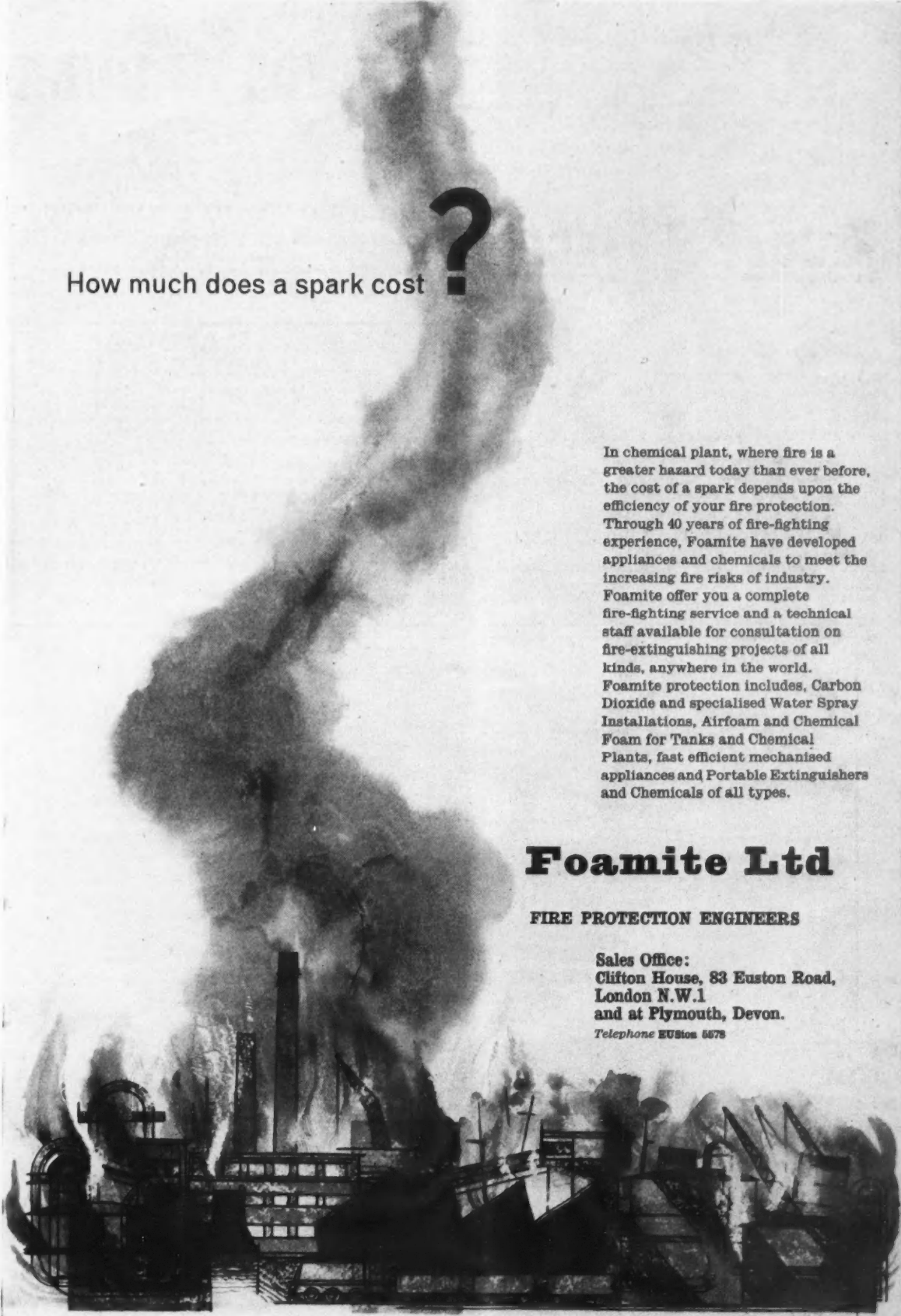
LIQUID FEED SYSTEMS.

Our Laboratories at Peterborough are equipped for demonstrations and we advise on and develop particular projects through all stages from pilot plant assessment to production plant trials.

*For further information and
technical data, please write to:*

Baker Perkins Ltd.

Westwood Works · Peterborough



How much does a spark cost ?

In chemical plant, where fire is a greater hazard today than ever before, the cost of a spark depends upon the efficiency of your fire protection. Through 40 years of fire-fighting experience, Foamite have developed appliances and chemicals to meet the increasing fire risks of industry. Foamite offer you a complete fire-fighting service and a technical staff available for consultation on fire-extinguishing projects of all kinds, anywhere in the world. Foamite protection includes, Carbon Dioxide and specialised Water Spray Installations, Airfoam and Chemical Foam for Tanks and Chemical Plants, fast efficient mechanised appliances and Portable Extinguishers and Chemicals of all types.

Foamite Ltd

FIRE PROTECTION ENGINEERS

Sales Office:
Clifton House, 83 Euston Road,
London N.W.1
and at Plymouth, Devon.
Telephone EUSTON 6678

Hydrometers...

PLAIN AND COMBINED FORMS.
PRECISION TYPES FOR SPECIFIC
GRAVITY, DENSITY AND ALL
ARBITRARY SCALES.

MADE TO I.P., B.S., S.T.P.T.C.
AND A.S.T.M. SPECIFICA-
TIONS.

ZECOL**ZECOL**

EST.
1888

Thermometers...

HIGH-PRECISION INSTRUMENTS
FOR SCIENTIFIC RESEARCH—
ANSCHUTZ, CALORIMETER AND
SECONDARY STANDARDS.

Combined form
A.P.I. Hydrometer

Instruments N.P.L. Certified if required

G. H. ZEAL LTD.

Lombard Road, Morden Road, London, S.W.19

PHONE:
LIBERTY 2283/4/5/6

GRAMS:
ZEALDOM, SOUPHONE, LONDON

CARRIERS OF**LIQUIDS IN BULK**

ACIDS • OILS • SPIRITS
AND GENERAL CHEMICALS

HAROLD WOOD & SONS LTD.
Wormald St. • Heckmondwike

Tel.: Heckmondwike 1011/5

Branch Office: Cranes Close, Nevendon Industrial Estate, Basildon, Essex.
Telephone: Basildon 20511-2.

**CHEMICALS AND FEEDS
LIMITED**

ADELAIDE HOUSE, KING WILLIAM STREET, LONDON, E.C.4.
Tel.: Mansion House 9621 (3 lines) Cables: 'Chemifed' London

Sole U.K. Distributors for

PEARL ESSENCE
SYNTHETIC & ORGANIC

Produced by:

N.V. Chemische Fabriek 'Noord-Holland' Beverwijk, Holland.

Associated with: P. Leiner & Sons, Ltd., Treforest Chemical Co. Ltd.,
Glamorgan Alkali & Acid Co. Ltd., Miskin Lime Co. Ltd., and other
U.K. and Overseas manufactures.

acids**PURE & COMMERCIAL**

for all purposes . . .

SULPHURIC**OLEUM****BATTERY****NITRIC****HYDROCHLORIC****DIPPING ACID****DISTILLED WATER****(PURE)****SPENCER CHAPMAN & MESSEL LTD**

45 • PARK LANE • LONDON • W.1. Tel. GROsvenor 4311 (4 lines) Works: SILVERTOWN • E16



Reduce the fire risk

by using one of the I.C.I. non-inflammable solvents:

CHLOROFORM
METHYLENE CHLORIDE
PERCHLOROETHYLENE
TRICHLOROETHYLENE

The wide range of applications for these solvents includes general uses, such as extraction processes for oils, fats, waxes, pigments, dyes and fine chemicals, and more specialized uses, such as metal degreasing (trichloroethylene, dry-cleaning (trichloroethylene - "Triblene" and perchloroethylene "Perthane") and the formulation of paint, varnish, emulsions, resins, etc.

Imperial Chemical Industries Limited
 London S.W.1.





Stainless Steel Plant and Holloware



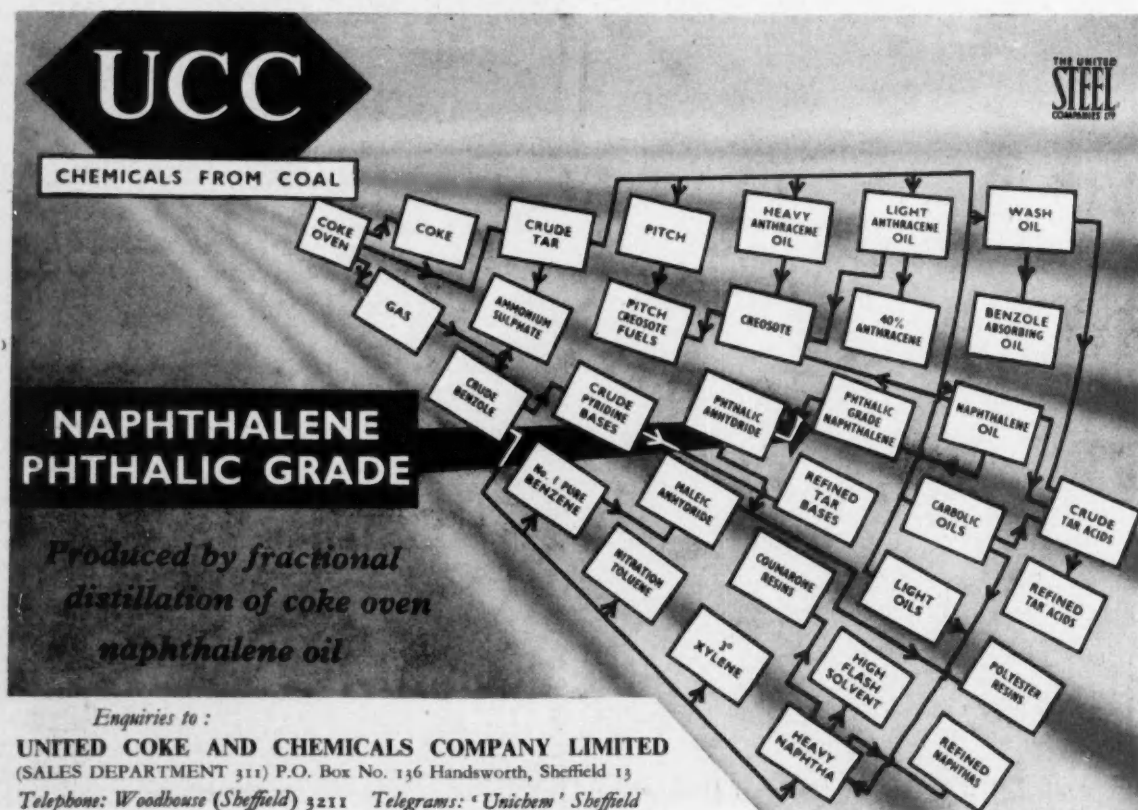
We are manufacturers of a wide range of holloware in stainless steel which finds use, because of its resistance to many forms of chemical attack, in dye works, chemical factories, food factories, laboratories and, because of its inherent cleanliness, in hospitals.

We are also plant manufacturers in stainless steel, and will be pleased to have your enquiries for any stainless steel equipment. We are able to fabricate vessels for light, medium and severe duty as laid down in BS. 1500.

THE TAYLOR RUSTLESS FITTINGS COMPANY, LIMITED.

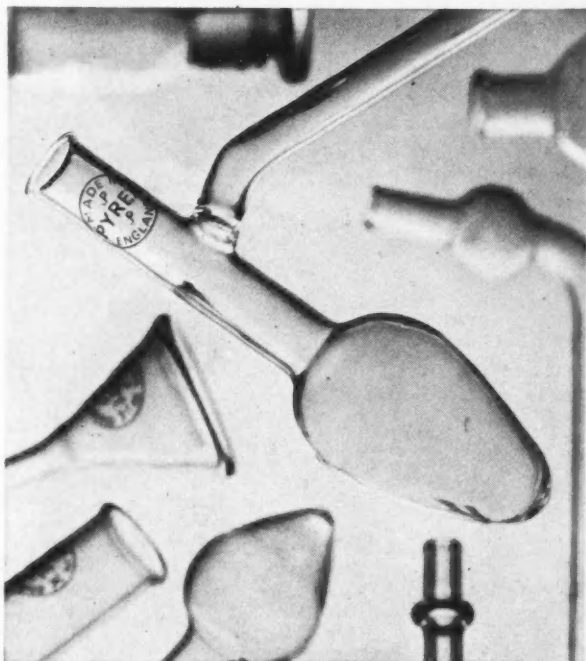
Leeds 638711/2/3
Abbey 1575

Head Office:—Ring Road, Lower Wortley, Leeds 12
London Office:—14, Great Peter Street London S.W.1



Enquiries to :
UNITED COKE AND CHEMICALS COMPANY LIMITED
(SALES DEPARTMENT 311) P.O. Box No. 136 Handsworth, Sheffield 13
Telephone: Woodhouse (Sheffield) 3211 Telegrams: 'Unicem' Sheffield

It's a somewhat smaller world



Though the scientific world is enlarging in all directions, especially in schools, the trend of apparatus is in the opposite direction: towards somewhat smaller, neater, cheaper, safer — in fact, Semi-micro — equipment. Especially in schools. Pyrex have given much thought to designing a Semi-micro range that is simple without being over-rigid, yet covers the widest field of routine experiments. Needless to say, all parts are made to strict specification to allow for interchangeability: this attention to detail explains why Pyrex is the most popular and widely used laboratory and scientific glassware

Pyrex semi-micro apparatus

is made from the same borosilicate glass as other PYREX laboratory and scientific glassware. It therefore

- withstands thermal shock
- resists chemical attack
- has exceptional mechanical strength

Saves costs — smaller quantities of reagents are used

Safer — less danger from explosions and toxic fumes

More experiments can be carried out in a given period

Saves space — less working space, less storage space needed

Develops manipulative techniques — students acquire skill in handling small quantities of reagents

Comparatively low initial cost — and being PYREX, it vastly reduces replacement costs

Assemblies can be economically made up using rubber tubing and bark corks

● Ask for a catalogue from

PYREX

Regd. Trade MarkBRAND

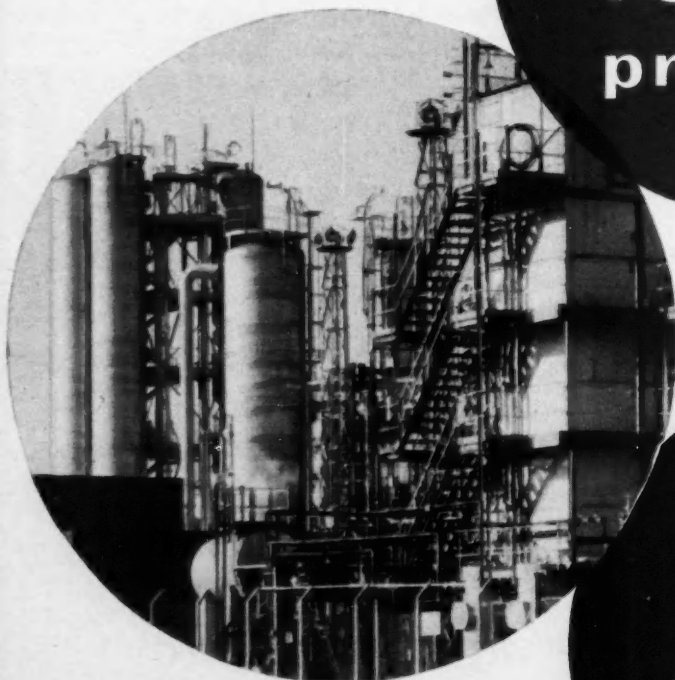
Laboratory and scientific glass

INDUSTRIAL SALES DIVISION JAMES A JOBLING & CO LTD Wear Glass Works Sunderland

*Hydrogen
Peroxide*

Europe's most
modern plant
now in operation
at Warrington
has helped
to make

available at
greatly
reduced
prices



The significant
price reduction of
Laporte Hydrogen
Peroxide makes
it even more
attractive for use as
a reagent in
organic syntheses.

LAPORTE



Laporte Chemicals Ltd., Luton

Telephone : Luton 4390

VOL. 81

No. 2073

APRIL 4 1959

Telephone: FLEet Street 3212 (26 lines)
 Telegrams: Allangas - Fleet - London

Editor
M. C. HYDE

Manager
H. A. WILLMOTT

Director N. B. LIVINGSTONE WALLACE

Midland Office

Daimler House, Paradise Street,
Birmingham. [Midland 0784-5]

Leeds Office

Permanent House, The Headrow,
Leeds 1. [Leeds 22601]

Scottish Office

116 Hope Street, Glasgow C2.
[Central 3954-5]

IN THIS ISSUE

Urea as Fertiliser	574
Continuous Hex Process	574
Concentration of N, P and K	575
Distillates	576
Fluidisation Symposium—2	577
Nitrogen in Asia and America	579
Solvents for Spectroscopy	580
Analytical Review	581
Sheehan's Award for Penicillin	582
Equipment Review	583
Overseas News	586
People in the News	587
Trade Notes	588
Market Reports	588
Commercial News	589
New Patents	590
Diary Dates	590

Annual subscription is: home, 52s 6d,
overseas, 60s, single copies 1s 6d (by
post 1s 9d)

C

CHEMICAL AGE

BOUVERIE HOUSE • 154 FLEET STREET • LONDON • EC4

WHITHER ACETYLENE?

ACETYLENE as a chemical raw material has been the subject of a searching investigation recently by the International Acetylene Association (*Chem. and Engng. News*, 1958, 37, No. 12, 22). In general the outlook for acetylene is considered bright in the U.S., although there are some doubts. The market for acetylenes at present is estimated at about 20 to 25 million lb. per year. This market, main U.S. producers feel, could be larger.

One of the problems associated with acetylene is its high price—from 80 cents to \$4.00/lb. in semi-commercial quantities. General Aniline and Film and Air Reduction Chemical Co. believe that market research and development of new outlets would help, the large volume of sales gained leading to lower prices. The key to economic acetylene, however, is undoubtedly cheap natural gas or coal. Acetylene can be produced by the Badische Anilin- und Soda-Fabrik process from natural gas (that is partial oxidation of methane) on a large scale and continuously. This method of production could be employed utilising the low cost and continuously available natural gas at or near the Texas-Louisiana Gulf Coast. Indeed, there are gas-derived acetylene plants in that area.

From the cost angle, natural gas-derived acetylene also provides process heat and energy for air separation as well as the main raw material and co-product gases. These include nitrogen and carbon monoxide which can be converted on site to ammonia and methanol. The value of these products is a big factor therefore in costing acetylene; particularly as it is reported that U.S. natural gas prices are rising at an average of 2% per year.

With regard to calcium in carbide-derived acetylene, the big factor is coal. The calcium carbide plants use coal to make electricity for heating furnaces to make the lime, and for coke as a raw material. Coal prices are rising although not at the same rate as the natural gas prices, but enough to affect the final acetylene price.

What appears to be concerning U.S. acetylene producers is the recent announcement by Standard Oil Co., Ohio, that they plan to produce acrylonitrile (for which acetylene has up to now been a key chemical raw material) from propylene and ammonia (see *CHEMICAL AGE*, 21 March, p. 507). Acrylonitrile, together with vinyl chloride, trichloroethylene, neoprene and vinyl acetate have totalled some 2,000 million lb. a year to meet the demand for acetylene, for acrylonitrile-based fibres. American Cyanamid last year increased acetylene capacity to 80 million lb. per year. The number of vinyl chloride producers, however, who are making vinyl chloride starting with ethylene and chlorine, and who are then adding co-product hydrochloric acid to acetylene for a second mole of vinyl chloride, is growing. Ethylene as well as propylene is judged to be a strong competitor to acetylene for vinyl chloride production. Also, acetylene was once used for acetaldehyde production, but today, this chemical is being produced from petroleum sources.

In the production of neoprene, acetylene as the main raw material has no competitor. The U.S. acetylene producers are therefore hoping that the demand for acetylene for neoprene, for acrylonitrile and even for vinyl chloride will be such as to take up the major part of their production.

In the U.K., the position is somewhat different. There are no natural gas deposits but there is a growing source of refinery gases, and hence of ethylene and propylene. The large British users of acetylene are well aware of these other materials, but the general opinion appears to be that some 10 to 20 years may elapse before any radical change-over may be noted. In the meantime, there is no lack of interest in acetylene as a raw material and in calcium carbide as its source material. Calcium carbide for acetylene manufacture is being produced in large quantities. A most efficient plant is that of the Distillers Company in South Wales, and British Oxygen's Carbide Industries Ltd., are, of course, now constructing a carbide plant in Northern Ireland, which in due course will provide acetylene for the adjacent Du Pont neoprene plant. The U.K.'s first acrylonitrile plant, that of I.C.I. at Cassel Works, Billingham, will also use acetylene as its raw material.

Some idea of the tonnage of acetylene produced in this country can be gleaned from the appropriate consumption figure suggested for 1957-58 for acetylene used in the plastics industry (in particular, for the thermosetting materials), which was about 28,000 tons per annum (carbide equivalent 93,000 tons).

Acetylene is available in adequate quantities and at internationally competitive prices. Based primarily on acetylene in the U.K., is production of vinyl chloride and vinyl acetate polymers and copolymers and shortly neoprene and acrylonitrile. Acetylene from carbide, however, is a relatively expensive starting material and unless cheaper acetylene can be produced (as from liquid methane, for example) efforts will be made to develop new methods of production based on cheaper raw materials, that is, the petroleum-derived ethylene, propylene, etc.

UREA AS FERTILISER

DURING the last four years it has become apparent that there has been a growing interest in the use of urea as a fertiliser. Consumption data reported in the recent Food and Agricultural Organisation of the United Nations questionnaires over the years 1955 to 1958 show that Japan and the U.S. are by far the largest consumers representing in 1958 respectively 37% and 22% (116,400 tonnes) (70,000 tonnes) of the total world figure (312,000).

Such has been the interest in urea that production and use of urea stands out with regard to the kinds of nitrogenous fertilisers now being employed. Because of the expectation of a considerable increase in demand, there are reports of many projected new plants for the manufacture of urea, or extension of existing ones, in various countries. Japan, for instance, is suggested as likely to have an increase in planned capacity of 184,000 tonnes, Pakistan 77,000 tonnes, Union of South Africa 51,000 tonnes, Taiwan (Formosa) 39,000 tonnes, Netherlands 31,000 tonnes, Belgium 23,000 tonnes and Austria 6,000 tonnes. These figures thus represent a potential increase in production of urea in the next few years to more than double the total reported world production in 1958. In the U.K. the trend is towards the production of complex fertilisers.

A notable advantage of urea in comparison with other solid nitrogenous fertilisers is its high concentration (46% N). There is, therefore, a marked reduction in delivered cost per unit of nitrogen through savings in freight charges, especially where long hauls overland are involved. A potential disadvantage of urea is its hygroscopicity, which can lead to serious deterioration in storage and application, especially in humid climates. This disadvantage, however, can be overcome by 'prilling'. To enable urea to be prilled successfully without the transformation of the urea to biuret (toxic to plants) due to the heat required in the process, much development work has been required. It is now

possible to produce prilled urea in such a way that formation of toxic biuret is reduced to a safe level.

CONTINUOUS HEX PROCESS

FLUID bed reduction of UO_3 to UO_2 is the main feature of the U.S. Atomic Energy Commission's new continuous process for uranium hexafluoride production at their gaseous diffusion plant at Paducah, which is operated for them by Union Carbide Nuclear. Previously hex production has been by a less continuous method.

The uranium hexafluoride plant is small and requires therefore only a moderate capital outlay. The product is thus produced at a very low cost, it is claimed. Overall yield of the uranium is 99.99%.

Starting material is uranium trioxide, which is converted to uranium dioxide continuously. The fluidised beds are described as electrically heated twin units, 14 inches in diameter and 5 inches high, with the bottoms tapered to 10-inch diameters. Cracked ammonia, for fluidisation, enters a sintered stainless steel diffusion plate at the bottom of the beds. Uranium trioxide particles are then injected into the bottom of the first bed, where three-quarters of the trioxide is converted to dioxide by reduction with hydrogen (from the cracked ammonia) at 1,000°F. Any unreduced trioxide is converted in the second bed, and the excess hydrogen is burned and filtered to recover any uranium.

Hydrofluorination of the dioxide to uranium tetrafluoride is carried out continuously and countercurrently in three ribbon screw reactors arranged in series. Yield is between 94 and 99%. The uranium tetrafluoride is then fluorinated to the hexachloride in a vertical water-cooled flame reactor with fluorine gas at around 600°F (lower temperatures encourage slag formation on the walls and higher temperatures burn the wall). Dust is removed from the gaseous uranium hexafluoride in a cyclone, after which the product is collected by freezing, liquefied and stored.

PHOSPHORIMETRY

ANOTHER method for the analytical chemist to add to the growing list of analytical techniques is phosphorimetry. This is accomplished by means of a new device developed by American Instrument Silver Spring, M.D., U.S.—the spectrophosphorimeter. The new instrument, designed by R. J. Keirs, Florida State University, uses the fact that many organic molecules containing multiple bonds phosphoresce when excited by ultra-violet light. Phosphorescence of each such molecule is stated to be unique. Thus for qualitative analysis the frequency, lifetime, quantum yield and vibrational pattern can be used. Also, since phosphorescent intensity depends upon concentration, the two can be correlated to obtain a quantitative picture.

Compounds which will phosphoresce included ethylene derivatives, hydrocarbons, nitro-compounds, aldehydes, ketones and porphyrin-like substances. The method has also been applied to some vitamins, sterols and amino acids.

In use, light is emitted from a high-pressure mercury lamp and dispersed by a grating monochromator. Wave lengths between 200 and 800 millimicrons can be selected manually or the whole range scanned automatically. Radiation passes through a fixed-slit system on the excitation monochromator and a phosphorescope and strikes the sample submerged in liquid nitrogen to prevent deactivation from collision of the molecules. The fixed-slit system is used to prevent the excitation radiation from reaching the photomultiplier tube.

Phosphorescence emitted by the sample is dispersed by means of a second monochromator and is picked up by the photomultiplier tube and converted to an electrical output. The output signal fed to a photometer for amplifying is read out on a meter, or it can be coupled to the vertical axis of an oscilloscope or to a recorder. These latter are used to plot the spectra and decay curves.

Plea for Greater Concentration of N, P & K

Farmers May Draw N Solutions and Trace Elements from Depot Network

A PLEA for a still greater concentration of N, P and K in fertilisers was made by Mr. Howard U. Cunningham, when he recently gave the Fertiliser Society's first Francis New Memorial Lecture in London. Mr. Cunningham, who was wartime Controller of Fertilisers, was after the war, until his retirement in 1957, managing director of Scottish Agricultural Industries, Ltd. The main theme of his paper, though not the only one, was concentration, the provision of more plant-food per ton of fertiliser.

With the development of more concentrated primary materials containing nitrogen, potash and phosphate, the average content of compounds had been steadily advancing. Thus, as a result of more concentrated mineral phosphate materials, "the difference between the present degree of concentration achieved and mixed fertilisers based on ordinary superphosphate is one million tons to be loaded out from factories, carried to farms and distributed, at a cost in manpower and fuel of about an equivalent number of pounds sterling: no mean contribution to the National economy." But we were as yet only half way to the attainable degree of concentration.

Greater N, P and K Purity with Concentration

Concentration meant greater purity in terms of N, P and K. It was unsound and unscientific to fear fertiliser purity because formerly less concentrated NPK fertilisers also added to soils larger amounts of trace and secondary elements. It was neither precise nor economic to provide these other nutrients by transporting about a million tons of extra material, much of which was unwanted. "If a field or a crop or a district is short of sulphur, let us apply it . . . and let us know why we are applying it and how much, rather than cover the country indiscriminately with a most expensive form of insurance against the possibility of sulphur being needed."

Our rapidly expanding use of potash, for supporting bigger arable crop yields and intensively utilised grass, was bringing with it an increasing use of chlorine because this was the lowest-cost carrier of potassium—but chlorine was more likely to be a liability than an asset to crops and soils.

Blunderbuss methods for supplying nutrients outside the NPK trio must be wasteful and dangerous—"what we want to achieve in manufactured fertilisers is the precision of a rifle."

But in the quest for greater fertiliser concentration and NPK purity, fertiliser manufacturers could not say to the farmers that "our job is N, P and K—you can go elsewhere with your minor

ingredient and trace element difficulties." If already trace element and similar nutrient problems were tending to increase, this was not due to present achievements in concentration but simply to our bigger output of crops and stock. Mr. Cunningham doubted the justification of special fertiliser mixtures that incorporated trace element supplies. It seemed better to encourage the present practice of dealing with these deficiencies by the low volume sprayer, but this did not take the problem out of the fertiliser industry's responsibility for "increased use of N, P and K depended on no other element being a limiting factor."

If farmers tackled trace element deficiencies by spraying, it might prove convenient and economic to have delivery in solution form, liquids were easy to mix at factory or depot and easy to dilute on the farm. Mr. Cunningham saw possibilities in the future of depots throughout the farming areas, not unlike petrol pump stations, from which farmers could draw nitrogen solutions with trace elements added.

In France and America there was expanding use of anhydrous ammonia containing 82% of nitrogen, but both those countries were used to handling liquids under pressure because of their developed use of butane or propane as fuels. Here he doubted, because of the lack of equipment and depot storage facilities, whether the economic benefits of anhydrous ammonia as a fertiliser could be realised. But nitrogen solutions not under pressure could contain up to 40% of nitrogen, and for British agriculture those might become the "ideal economic medium for delivering minor and trace elements in solution to the farm."

Animal Health Troubles Attributed to N and P

A member of the Caine Committee on Grassland Utilisation, whose report was issued last year, Mr. Cunningham dealt with fertiliser-grassland relationships, particularly the many animal health problems that are attributed, if not to fertilisers as such, to grass whose output has been intensified by the use of fertilisers. Of all those the most powerful animal health fear was that of staggers or hypomagnesaemic tetany. It concerned the fertiliser industry because two of the NPK trio were often blamed, nitrogen, against which there was in fact little evidence except that extra grass growth showed up deficiencies; and potash, on the grounds that excess potash could displace magnesium and limit its plant uptake.

He pointed out that some farmers were now applying potash to grass after, instead of before, the critical period for grass tetany. This could also be of some benefit to the fertiliser industry by

lengthening the season for deliveries, creating a June to August demand for NK and NPK fertilisers and increased autumnal demands for PK grassland fertilisers.

Rethinking about fertiliser application timing did not apply to grass alone. On corn land that was potash-deficient the amount of potash required often could not be applied in the combine drill (with the seed) without risk of damage to germination. Rising yields per acre were accentuating this hazard. It might be better practice to use the combine drill to supply mainly nitrogen and phosphate, and apply the potash separately.

Mr. Cunningham also suggested it was time to drop the fertiliser yardsticks of N, P₂O₅, and K₂O, and express fertiliser contents instead by the elemental yardsticks of N, P and K. "If we are honest with ourselves and do the calculation as P and K, we find that in compounds in this country we are supplying farmers with half a million tons of what they are paying us for, N, P and K, and we wrap it up with other stuff to a total of nearly 2½ million tons."

That was not done deliberately; to date we had not been scientifically clever enough to provide P and K without the wrapping.

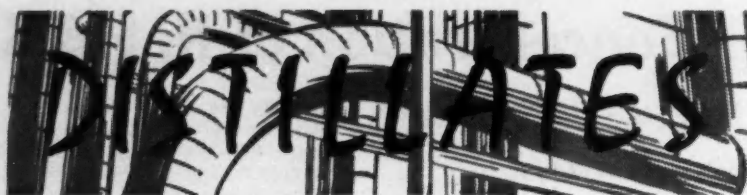
An interesting comment on this was made by Mr. J. W. Parkes (W. and H. M. Goulding, Ltd., Dublin) in proposing the vote of thanks: recently Eire had adopted the N, P and K system of declarations and as a result ordinary superphosphate, formerly sold on a basis of 40% content of tri-calcium phosphate, was now sold as containing 8% of P, and this was making many farmers ask what the remaining 92% of the fertiliser was composed of.

Howards to make Phthalic Anhydride

A PHTHALIC ANHYDRIDE unit is to be installed at the Ilford works of Howards of Ilford Ltd. With a planned capacity of 3,000 tons per annum, it will be based on a proved Continental design which produces a high yield of high-quality material and has been operated successfully for a period of years. Site preparation is well advanced and it is expected that the plant will be on stream by the end of 1959.

Part of the output of this plant will be utilised for Howards's own captive use in the manufacture of their specialised phthalate esters, but a substantial proportion will be available for sale.

Considerable surplus production capacity for phthalic anhydride exists both in the U.S. and Europe as a whole but, up to the end of last year, the U.K. was a large importer. The major U.K. producers have recently announced increases in their production capacity and Howards estimate that, when their own plant comes on stream, the needs of the U.K. market for this material will be fully met from home production.



★ **TRADE** statistics usually make dull reading, but most of my readers will be heartened by the preliminary figures relating to chemical exports and imports in January and February of this year. They show that the higher export performance noted in January has been maintained.

U.K. exports of chemicals for the two months were up 3% on the same period of 1958 and represented a monthly average of £22,520,000, well above the monthly average for the whole of 1958 (£21,794,000) and the monthly average for 1957 (£22,157,000) when U.K. chemical exports reached their highest ever levels.

This increase in overseas trade in the early months of 1959 was accompanied by a 5½% drop in chemical imports. The January-February monthly average was £9,833,000, against £10,391,000 for the same two months of 1958.

★ **IT SEEMS** that pressure for the Terylene patent case to be heard in public is likely to lead to a change in the regulations covering the admittance of the public to patent hearings. The application to extend the Terylene patents, opposed by British Celanese, was granted as reported in *CHEMICAL AGE*, 21 March, p. 499; it was heard in private.

Now the Board of Trade has laid before Parliament rules under the Patents Acts 1949-1957 providing for the admittance of the public from 1 July. There are certain conditions, the first of which is that "the dispute must be between two or more parties". Only matters arising after the publication of the complete specification are covered; before publication, the patent application is a confidential document. The Comptroller of Patents is also to have the power, after consulting the parties represented, to depart from the general rules.

★ **AS** the only surviving former professor of chemistry at St. Andrews University, Sir Robert Robinson wrote to *The Times* on 28 March expressing surprise and disappointment at the decision of the university court to 'postpone' the development facilities for science teaching and research at St. Salvator College.

Such facilities are to be provided at Queen's College, Dundee. Sir Robert points out that this is not relevant to the needs of teaching at St. Andrews itself and there is also no guarantee that the wider circle of supply centring on St. Salvator can be induced to turn their attention to Queen's College. Apparently the number of applicants for entry in September next to St. Andrews science schools is six times as great as at Dundee.

Referring to the St. Andrews traditions, Sir Robert states that chemists trained there can be found in key positions in the chemical industry as well as in the official and academic worlds. He says the 'deplorable decision' should be expunged from the record and that development at St. Salvator, or an associated site, and at Queen's should proceed in parallel.

★ **THE GROWTH** of advertising in this century has accompanied the rapid expansion of the production of chemicals, and the history of the pioneer years of advertising is just as full of tales of ingenuity and enterprising personalities as industry itself. That is why all engaged in business today will profit from reading 'Advertising: The Forgotten Years', published recently by Ernest Benn, price 21s.

It deals with those early days of advertising growth about which too little is known—the first quarter of this century. But it is not presented in an academic manner like so many books on advertising. The author is Mr. Eric Field, governing director of an advertising agency, whose personal experience goes back to 1905 and he presents the facts in a racy, readable form based on his own personal knowledge not only of advertising developments but of the personalities involved.

★ **A BOUQUET** and a brickbat appear in the quarterly report of the Mersey River Board. The bouquet goes to the British Chrome and Chemical Co. Ltd., who have installed a third pumping station at their Hall Lane works to return polluting tip drainage back to the works for re-use. This new plant is said to have appreciably reduced pollution of the Blackshaw Brook from this source.

The brickbat goes to Brocklehurst-Whitson Amalgamated Ltd., near Macclesfield, who discharge about 120,000 gall. a day trade effluent causing bad pollution of the Bollin almost at its source. The company had said, it is reported, that they would negotiate with the local council to connect their effluents to the sewers—that was in mid-December 1958, but by 22 January the Clerk to the Council said that no approach had been made.

The reports adds that the Clerk has been authorised to institute legal proceedings against the company.

★ **THE AGREEMENT** for the sale of urea know-how reached by W. R. Grace and Co., Foster Wheeler and Pechiney of France ('Overseas News', p. 586) should give Grace a return on the heavy expenditure made on solving snags in scaling-up

Pechiney's original process from one-ton-a-day to Grace's 150-tons-a-day plant at Memphis. Capacity is now being doubled. Under the agreement Grace and Pechiney will share royalties on all new plants using the Grace-Pechiney process in any country.

Grace research engineers have simplified the Pechiney synthesis operations, improved purification and developed a new prilling technique. These and other changes are all part of the new licensing arrangement. It is claimed that the new purification process gives a product with less oil and other impurities than any other. A method for making feed-grade urea as micro prills was developed.

A new ammonia recovery unit saves 10 to 15 tons of ammonia a day; the savings are expected to pay for the unit within a year. Although Grace believe the Pechiney have the most economical recycle process, particularly for large-scale production, they will use the Dutch State Mines process at their new plant in Trinidad. This, however, will be a 'once-through' process and it will produce ammonium sulphate with urea.

★ **REFERENCE** at the 17 March meeting of the Parliamentary and Scientific Committee to the effect that "two bodies are at present discussing the future of microbiological research in this country and proposed to produce a report", intrigued me. The committee decided that no further action could be taken as regards D.S.I.R. and that it would await the issue of this report.

So far I have been unable to trace any definite work on such a report, although it is well known that a number of organisations and individuals are working on suggestions for the continuation of research on industrial microbiology in this country. The Institute of Biology is certainly not letting the matter rest and has gone on record as being willing to co-operate with any of the other scientific societies likely to be concerned.

It is hoped that all these discussions will point the way to a means of establishing a small national microbiological laboratory. There are many difficulties to be overcome, the biggest hurdle perhaps being the fact that although many large industrial firms are concerned with microbiological research, their interest is incidental to larger problems.

★ **A READER** of this page who is chief chemist for a large Midlands organisation has sought my help in trying to find suppliers for two chemicals. Both he and I have tried a number of firms without success.

He seeks 'spot' quantities of '4-nitro-3-hydroxy benzoic acid' and '2:7-diamino phenylene oxide'. If any readers know of a supplier, I should be much obliged if they would send the name and address to me at 154 Fleet Street, London E.C.4.

Alembic

I.CHEM.E. SYMPOSIUM ON FLUIDISATION-2

Designs of Fluidised Reactors for Naphthalene Oxidation Reviewed

IN spite of the important advantages which the fluidised-catalyst technique has over the fixed-bed technique for the manufacture of phthalic anhydride, the latter is still used almost exclusively. Dr. H. L. Riley, Rotherwood Laboratories, United Coke and Chemicals Co. Ltd., Orgreave, Handsworth, Nr. Sheffield, therefore reviewed in a paper presented at the 'Fluidisation symposium' of the North-western Branch, Institution of Chemical Engineers, recently, the patent literature which brought to light the difficulties which have been encountered by pioneers in this field and which have caused the set-back in the development and growth of this new method of carrying out controlled air oxidations.

Dr. Riley indicated that the set-back had arisen because of the "belated appreciation of the factors involved in the scaling up of laboratory reactors through pilot plants to large production units". In the past, phthalic anhydride has been manufactured in small units, and as demand has increased, output has been stepped up by the addition of further small units. Confronting the designer of a large fluidised-bed phthalic anhydride plant is the range of choice available. A large number of different types of catalyst have been described, some fine powders, others granular or spheroidal. Optimum temperatures of operation range from 300° to 550°C; contact times as low as a fraction of a second up to several seconds have been recommended and air:naphthalene ratios also cover a similarly wide range.

Standard Oil's Reactor

The first reactor discussed by Dr. Riley was that of S. B. Becker and Standard Oil Co. of Indiana, U.S. (1). Four reactors had been proposed for production of 2,000 to 3,000 lb./day of phthalic anhydride, from naphthalene (m.pt. 77 to 79°C) or by-product refinery stocks, high in methyl naphthalenes. The catalyst used was vanadia-chromia, and a bed temperature of 930°F (499°C), a gas velocity of 2 ft./s. and a contact time of 2 to 3 sec., were employed, with excellent conversion, it was stated.

An additional Becker patent (2) suggested that the space above the dense catalyst phase was preferably maintained at a lower temperature than that of the dense phase. The reactor bed was cooled by means of Dowtherm, mercury, etc., passing downwards through the annuli of a number of thimble tubes. Use of a quench fluid, to cool product gases, was stated not to be essential, but if it was desired to do this, quench fluid (cold air or other inert fluid) could be introduced.

Reactors designed by Standard Oil Co. of New Jersey were considered (3,4). In a further patent (5) details were given about the catalyst. The finely-divided catalyst (200-400 mesh per linear inch) used in beds several feet deep was abandoned in favour of a spheroidal catalyst of vanadium pentoxide prepared either alone or together with a promoter such as potassium sulphate. Parallel reactor tubes (2 in. dia.) contain layers of catalyst supported on grids and surrounded by one of the usual cooling liquids, water being preferred.

Besides the fused vanadium pentoxide microspheres (20 to 40 mesh) a fused vanadium pentoxide supported on corundum was also used as catalyst. This tended to 'fluff up' and go overhead under reaction conditions. Conversion to total acids of 74-93 mol. % was reported, but the products contained some 6 to 10.5% maleic anhydride. A further patent (6) indicated that the best results were obtained when the reactants were in contact with the catalyst for less than 1 sec., preferably for only a few tenths of one second. To overcome the severe limitations imposed by such requirements, a reactor was designed in which naphthalene-air mixture was fed counter-current to a descending shower of a micro-spheroidal catalyst (20 to 60 mesh) which was recycled through the reactor after cooling.

American Cyanamid's Abrasion Resistant Catalyst

American Cyanamid Co. had described (7) a catalyst possessing a high degree of abrasion resistance, which consisted of 40 to 75% of silica gel uniformly impregnated with 20 to 50% of a potassium sulphate, 3 to 25% of vanadium pentoxide and 0.05 to 5% of silver oxide or cerium oxide. The impregnated gel was calcined at 450°C for 8 to 10 hours, and ground to give the size grading $\times 100$ mesh (5 to 10%), $-100 + 200$ (30 to 40%), $-200 + 350$ (30 to 40%) and -350 (20 to 25%). Laboratory experiments with bed temperature 330-370°C; linear gas velocity 1-1.7 ft./sec.; naphthalene: air ratio, 1:11 to 1:22; catalyst bed depth 3 to 10 ft and contact times of 5-8.5 sec. gave 100% yields of phthalic anhydride.

In production reactors American Cyanamid (8) found that temperatures of 750 to 1,000°C developed, which were harmful to the catalyst, reactor and filters, causing considerable damage as well as endangering the safety of operators. Reaction products and any unreacted raw materials had therefore to be completely cooled prior to their emergence from the dense catalyst phase. This could be accomplished by dividing the dense phase into

temperature zones by the use of baffles and controlling the temperature in each zone selectively and individually by heat exchanging devices.

A linear gas velocity of 0.5 to 2.0 ft./s. was found satisfactory for naphthalene oxidation. The naphthalene:air ratio was preferably between 1:13 and 1:18. Contact time was 7 to 15 sec. and reaction and quench zone temperatures were preferably 350°C and 250°C respectively. A yield of between 90 and 105 lb. of phthalic anhydride per 100 lb. of 98% naphthalene charged was claimed with a silica gel catalyst, having the composition after ignition for two hours at 350°C of V_2O_5 , 9.0-10.2%; SiO_2 , 41-47; K_2O/SO_3 , 1.85-2.10; and particle size 98% through 80 mesh.

An interesting modification of these methods was described by Badische Anilin- und Soda-fabrik (9). A coarse catalyst (80% by weight between 28 and 48 mesh) consisting of silica gel as carrier containing 5.5% V_2O_5 and 35% K_2SO_4 was used in a fluidised bed 4.9 ft. deep. Reaction temperature was 345°C and gas velocity 14 in./s. The fluidising gas was recycle gas containing 11.3% oxygen and 61 g. phthalic anhydride/m³ to which had been added 34 g./m³ of naphthalene. After passing through a cyclone separator, the product gases contained 96 g./m³ and 8 vol. % of oxygen were cooled to 135°C and passed into a separation chamber where 14 g./m³ of phthalic anhydride were deposited. Effluent gas was diluted with oxygen and passed through a catalyst converter at 370°C and the resulting phthalic anhydride was separated as solid. This made up 60% of the yield, 40% having been separated as liquid. Total yield was 103% of the weight naphthalene charged (89.2% theoretical).

M. W. Kellogg Co. (10) had described a plant for carrying out vapour-phase oxidations in a fluidised-catalyst bed which they claimed was suitable for production of phthalic anhydride.

Catalyst Composition

The method of manufacture of a catalyst claimed by J. Robinson and Imperial Chemical Industries Ltd. to be suitable for fluidised bed oxidation of naphthalene had been described (11). The recommended composition was V_2O_5 , 7-12%; K_2O , 12-22% and SiO_2 , 40-55%, the remainder being substantially SO_3 .

Two somewhat different lines had been followed in development of the fluidised-catalyst method for manufacture of phthalic anhydride—granular catalysts, operated at high temperatures with short contact times in shallow beds and finely divided catalysts operated at lower temperatures and with longer contact times in deeper beds. In all the methods used it had been necessary to prevent excessive rise in temperature. It was suggested by Dr. Riley that one or more of the following reactions were concerned: oxidation of unreacted naphthalene; further oxida-

tion of maleic anhydride; and oxidation of naphthalene impurities.

To avoid naphthalene slip, it was suggested that distribution should be as uniform as possible. Of benefit here was the introduction of the fluidising gas through a suitable porous ceramic plate (12). Other suggestions were the use of electromagnetically-induced vertical oscillations, inducement of pulsations in the gas by vibrating plates, or sonic waves, etc., and the use of various mechanical devices.

In fluidised beds, it was possible when operating in the temperature range 320-360°C. to keep formation of maleic anhydride down to a low level. If the further oxidation of maleic anhydride was the cause of initiating the unwanted exothermic reactions in the expanded phase, it would seem, noted Dr. Riley, that a highly specific catalyst capable of giving good conversions to phthalic anhydride with minimum formation of maleic anhydride was required.

Thionaphthene, it was pointed out, was often one of the principal impurities in naphthalene. Air oxidation of thionaphthene in presence of vanadium pentoxide catalyst gave maleic anhydride. If the further oxidation of maleic anhydride was the initiator of the troublesome exothermic reactions, it would appear that the concentration of thionaphthene in the naphthalene should be kept to a minimum. The presence of alkyl naphthalenes could also be undesirable, since these on oxidation yielded highly condensed quinones of low volatility. If tarry matter condensed in hot delivery lines, at the temperature prevailing, it would undergo slow carbonisation yielding a highly reactive form of carbon. Vanadium and potassium compounds could catalyse carbon combustion and therefore if carbonised tar was contaminated with catalyst dust, ignition could occur. Another possible factor in the initiation of undesirable exothermic reactions was the presence of static pockets or layers of finely divided catalyst downstream from the fluidised bed.

Influence on Reactor for Phthalic Anhydride

Such considerations had an important bearing upon design and operation of a fluidised-catalyst reactor for phthalic anhydride production. Thus the catalyst should be sufficiently active and specific to give good conversions at a low temperature and its size grading should permit uniform and regular fluidisation. Catalyst disengaging space should operate at a temperature appreciably lower than that of the fluidised reaction zone but not so low that tarry products could separate, and it should be free from surfaces upon which catalyst dust could accumulate. Filters with adequate and efficient blow-back were preferable to a combination of cyclones and filters. Glass-fibre mat filters gave complete filtration without excessive pressure drop.

Of five methods of minimising the danger of excessive temperatures in the catalyst disengaging zone, cooling a special extension of the dense phase

(American Cyanamid process) was best for large reactors, stated Dr. Riley. For medium-sized and small reactors a combination of cooling tubes in the expanded phase and introduction of cold air into the expanded phase would possibly be adequate provided the condensation plant could cope with the rather more dilute product.

Heat Transfer Between Particles and a Gas in Fluidised Bed Discussed

SINCE very little reliable information had so far been published on heat transfer between gas and particles in a fluidised system two research investigators of the Department of Chemical Engineering, Imperial College, London, P. Ayers (now with British Aluminium Co.) and J. F. Richardson (now with A. Boake, Roberts and Co. Ltd.) carried out such an investigation. There had been two principle reasons for the lack of information. There had been a general lack of appreciation in the past that almost all the transfer took place in a shallow zone at the bottom of the bed and consequently many of the experimental results had been misinterpreted. Further, experimental difficulties of measuring or inferring the temperatures of the gas and solid in a very shallow zone were considerable and most of the techniques adopted had not been of sufficient accuracy.

Experimental results indicated that the temperature of the entering gas fell rapidly at first and then gradually approached a steady value at a distance of about 0.1 in. from the bottom of the bed. Since the temperature gradient was confined to this shallow zone, the solids and gas have been in equilibrium in the remainder of the bed, since otherwise, the gas temperature would have continued to fall.

In order to calculate the heat transfer coefficient it was necessary to know the surface area of the solids in the transfer zone. Measurements were therefore made with all the solids and the range of gas rates used in the heat transfer experiments.

Results of measurements of coefficients for the transfer of heat from a gas to particles in a steady state fluidised system could be correlated by the equation.

$$Nu = 0.054 Re^{1.25}$$

Where Nu = Nusselt number hd/k (h = heat transfer coefficient—gas to particle; d = particle diameter; k = thermal conductivity of gas), and Re = Reynolds number. Gd/e (G = mass flow rate of gas per unit cross-sectional area; d = as above and e = voidage of bed).

This equation applied for particle Reynolds numbers from 0.5 to 35 for flows of air and carbon dioxide between 35 and 480 lb./hr. ft.², and for spheres of glass, lead and petunia seed of diameters between 0.000374 and 0.00180 ft. The heat transfer coefficient had been shown to be independent of the position in the test bed and of the feed rate and thermal properties of the solids.

REFERENCES

1. USP. 2 373 008/1945.
2. USP. 2 453 740/1948.
3. BP. 568 913/1945.
4. BP. 583 032/1946.
5. BP. 633 128/1946.
6. USP. 2 489 346/1949.
7. BP. 665 976/1952.
8. BP. 702 616/1954.
9. BP. 754 665/1956.
10. BP. 787 924/1957.
11. BP. 633 334/1949.
12. BP. 705 615/1952.
13. BP. 683 703/1950.

It was shown that gas temperature changed rapidly at the bottom of the bed and became constant at distances greater than about 0.1 in. from the cloth. This suggested that the whole of the transfer took place at the bottom of the bed and that outside the transfer zone the gas and solids were at a uniform constant temperature. This concept was consistent with the observations of other workers (Heertjes P.M. and McKibbins S.W., *Chem. Eng. Sci.* 1956, 5, 161 and Richardson J. F., and Bakhtiar A.G. *Trans. Instn. Chem. Engrs.* 1958, 36, 283). Dependence of the Nusselt number for heat transfer to particles on the particle Reynolds number alone suggested that the physical properties of the solid were important, only in so far as they influenced the flow pattern of the gas. It was considered probable that the transfer process was controlled by the gas film coefficient and that the resistance to transfer in the solids was negligible in comparison.

In a fluidised bed, each particle was in a state of random motion and would be surrounded by a film of gas which would move with it. When a particle with its attendant gas film entered the hot zone at the bottom of the bed, the outside of the gas film would attain the temperature of the fluidising gas and heat would penetrate towards the particle by thermal conduction. When the particle left the hot zone, part of the heat continued to flow towards the particle, but the remainder was transferred back into the bulk of the gas, partly by conduction and partly as a result of attrition of the outer layers of the gas film.

Prices of Abridged Patent Specifications Cut

ILLUSTRATED abridgments of patent specifications published in the U.K. are contained in 'Abridgments of Specifications of Inventions'. Abridgments are divided into groups, each group relating to a special field of invention, and a volume of each group is issued covering a series of 20,000 published specifications of inventions. In order to reduce stocks, orders are being accepted for a limited period at considerably reduced prices for certain series. The specification numbers concerned are 500,001 to 720,000 published between 1939 and 1954. Details may be obtained from the Patent Office, Chancery Lane, W.C.2.

ASIA'S NITROGEN PRODUCTION ROSE 50% IN 1957-58

F.A.O. World Fertiliser Review—2

IN the years 1957 and 1958 total nitrogen production in Asia has shown an increase of almost 50%, but production of phosphoric acid has increased only slightly, F.A.O. state in their 1958 report.* Most of the increase in nitrogen production has occurred in Japan, whose estimated production in 1958 was 85% of the total for Asia and whose production forecast for this year is one million tons. The production forecast for Taiwan (Formosa) in 1959 (68,000 tonnes of N) is reported as nearly four times that for 1957. India's production in the three years under review has been stationary at just over 80,000 tonnes, while Pakistan, where production of nitrogen fertilisers began last year, has a production forecast of 10,000 tonnes of N in 1959.

Phosphate fertiliser production in Japan is stated to show practically no change in the period from 1957 to 1959, but in India, although production is still only about one-tenth of Japan's, the forecast for this year (38,000 tonnes P_2O_5) shows an increase to over three times that in 1956, indicating India will be the second largest producer in Asia.

Nitrogen Consumption

For the years 1956 and 1957 consumption of nitrogen in the Far East was just over 70% of the total for Asia, while that in South and South-East Asia was about one-quarter and in the Near East only about 3% of that total. Japan's consumption of nitrogen is noted as showing a 14% increase in the three years from mid-1956 to mid-1959. India's consumption in 1959 is expected to be almost double what it was three years ago; at 257,000 tonnes it will then be nearly 40% of Japan's consumption against only 24% in 1956. Turkey and Israel together account for about two-thirds of the total nitrogen consumption in the Near East.

India. Phosphate consumption in India is expected to reach in 1959 over three times what it was three years ago.

Potash consumption in Japan is reported at a somewhat higher level than P_2O_5 consumption of that country and represents nearly three-quarters of the total for Asia. India's potash consumption, although showing a marked increase, is only half that of P_2O_5 and only one-sixteenth that of nitrogen. Ceylon, for instance, uses about four times as much potash as India. As consumption of phosphate fertilisers in Asia is increasing much faster than production, the deficit has to be covered by imports.

Targets for fertiliser consumption under the Indian second and third five-year plans in thousands of tonnes are:

N from 300 in 1958/59 to 500 in 1961/62 and 1000 in 1965/66
 P_2O_5 from 80 in 1958/59 to 150 in 1961/62 and 500 in 1965/66

* Annual Review of World Production and Consumption of Fertilisers in 1958. Price 5s., H.M.S.O. (See also *Chemical Age*, 28 March, p. 533)

K_2O from 25 in 1958/59 to 45 in 1961/62 and 150 in 1965/66

By the end of the third five-year plan the projected consumption of N: P_2O_5 : K_2O would be 7:3½:1. Maximum production of ordinary superphosphate would be 120,000 tonnes P_2O_5 and out of the 500,000 tonnes P_2O_5 target, two-thirds would be in the form of complex NP or NPK fertilisers.

Pakistan. Three nitrogen factories are planned for Pakistan, two in West and one in East Pakistan. Of the former, one at Dandkhel, started operating last year, with an annual capacity of 10,000 tonnes N, as ammonium sulphate. The other, at Multan, is due to start up in 1960 with an annual capacity of 100,000 tonnes of ammonium nitrate and 60,000 tonnes of urea. Construction of the factory in East Pakistan, near the Sylhet natural gas field, has begun. It is due in production in 1961, with an annual capacity of 100,000 tonnes of urea.

Japan. In Japan, where urea production for fertilisers is already the largest in the world, plans are in being to increase production of this fertiliser from an annual capacity of 435,000 tonnes of urea to 788,000 tonnes.

Formosa. Three new government-owned factories in Taiwan which came

into production last year, will produce annually 70,000 tonnes Nitro-chalk, ammonium nitrate-calcium carbonate (20% N), 36,000 tonnes nitrophosphate (16% N, 14% P_2O_5) and 85,000 tonnes of urea.

China. Mainland China production capacity is stated to have increased by 115,000 tonnes of N, bringing the estimated production of ammonium sulphate to about three-quarters of a million tonnes in 1957.

Construction or reconstruction of eight large modern fertiliser plants is reported at Dairen, a three-fold enlargement of the plant to give a capacity of 800,000 tonnes has been started. The Nanking plant (170,000 tonnes ammonium sulphate) is being extended and a new plant added to give a 50% increase in capacity. A superphosphate plant is already in operation.

At Kirin, N.E. China, a modern plant is operating and another in Yunnan is reported as due to come into partial operation this year. Work has also started on two more large fertiliser plants elsewhere in China.

Chinese reports, based largely on official sources in the People's Chinese Republic, have stated that when all eight large plants are in full operation, their total output will be 1,800,000 tonnes of nitrogen fertilisers and 60,000 tonnes of superphosphate.

The target in the second five-year plan is set at a total fertiliser production of over five million tonnes, but the chairman of the State Planning Commission is credited with the statement that an output twice as high could be reached, the F.A.O. report states.

Fertiliser Consumption and Output In North and South America

THE unexpected check to fertiliser usage in the U.S. partly as a result of official measures to curb over-production by restricting or reducing farmland areas under cultivation, has not occurred as far as nitrogen is concerned. Increases for the three years from mid 1956 to mid 1959 (forecast) are, respectively, 11, 4 and 9%. Consumption of phosphate fertilisers has remained virtually constant, the F.A.O. report states. The forecast for 1959 indicates a marked recovery for this fertiliser, with an increase of 12% over 1958. Potash production increased "more than enough in 1957 and 1958" to cover all North and Central America's needs. The forecast for 1959 indicates that U.S. production, although increased, will again fall short of the expected much increased North American consumption.

South America. Large increases in the production of phosphoric acid and in the consumption of all three primary nutrients are recorded for Brazil. Chile has reported large increases in both production and consumption of nitrogen and phosphoric acid. For Peru, however, there have been relatively large reductions in production and consumption of N, P_2O_5 and K_2O , owing to greatly reduced supplies of guano. For 1957, on balance there are marked increases in

total South American production of nitrogen and phosphoric acid and in consumption of all three nutrients. Little change is expected to be shown for 1958 or for 1959. Exportable surplus of nitrogen is stated to be about 50% higher in 1957, 1958 and for 1959 also, but phosphoric acid and potash imports were required to cover excess of consumption over production.

The new nitrogen plant in São Paulo State was due to come into operation at the end of 1958 with an annual capacity of 100,000 tonnes of cal nitro (ammonium nitrate-calcium carbonate, 20.5% N). When in full production, annual output of fertiliser nitrogen will be over 21,000 tonnes. The rock phosphate plant in Pernambuco has an annual capacity of 250,000 tonnes of concentrated phosphate rock (30% P_2O_5). It is expected to be in full operation in 1959 when Brazil's total rock phosphate production will reach 300,000 tonnes. In Peru, start up of the new nitrogen plant is expected to reduce imports.

Will

DR. THOMAS HAROLD DURRANS, formerly a director of A. Boake, Roberts and Co., who died on 25 November, left £8,440 net. (Duty paid £338.)

In Parliament

OUTLETS FOR BIOCHEMICAL RESEARCH

THE Parliamentary Secretary, Ministry of Works, Mr. H. Nicholls, as representing the Lord President of the Council, was asked by Sir W. Wakefield, to what extent the Department of Scientific and Industrial Research was encouraging investigation of the advances made in biochemical research as suggesting analogous developments in methods of generating and storing electricity.

Mr. Nicholls replied that D.S.I.R. appreciated the possibility that the results of biochemical research might eventually be of importance in the development of methods of generating and storing electricity and was always willing to consider ways and means of encouraging any promising ideas in that field.

New Uses For Fission Products Under Investigation

Referring to possible new uses for fission products, the Prime Minister speaking in the House last week said these lay in industrial chemistry, agriculture, food processing, insect control and bacteriological sterilisation. Applications were investigated in collaboration with the industries concerned, results so far achieved were promising.

No Harmful Effects From Irradiated Feeds For Animals

Research on the irradiation of foodstuffs was the subject of a written Parliamentary question last week. Mr. H.

Nicholls, Parliamentary Secretary, Ministry of Works, said that the keeping qualities, flavour, appearance and texture of fish, meats (particularly chicken) and potatoes after irradiation had been examined by three D.S.I.R. laboratories—Torry Research Station, Low Temperature Research Station and the Ditton Laboratory.

The A.E.A. was observing the long-term effects of feeding animals with foodstuffs preserved in this manner; so far no harmful effects had been noted.

Shell-Mex and B.P. Plan Refinery in Northern Ireland

Lord Glentoran, Northern Ireland Minister of Commerce, announced in the Northern Ireland Parliament recently (Tuesday, 24 March) that Shell-Mex and B.P. Ltd. have stated that their parent companies are in principle willing to construct and operate a refinery in Northern Ireland subject to satisfactory conditions being negotiated. The location will depend on more detailed investigations but Londonderry "is to be given the closest consideration as a possible site."

I.C.I. Acetone Cyanohydrin Shipped to Hungary

Export of acetone cyanohydrin by the Cassel Works of I.C.I. Billingham Division to Hungary recently was the first shipment of this product in bulk to the Continent. The consignment was shipped in a rail tanker.

Hopkin and Williams Introduce Solvents for Spectroscopy

SOLVENTS specially suitable for use in absorption spectroscopy have now been introduced by Hopkin and Williams Ltd., Freshwater Road, Chadwell Heath, Essex, in response to numerous requests for such materials. In particular, the rapidly increasing use of quartz spectrophotometers has created a correspondingly increased demand for solvents of adequate ultra-violet transparency and it is in this branch of the spectroscopic field that the first Spectrosol items are expected to find their main application.

A limited selection of the more useful solvents, both polar and non-polar, of high ultra-violet transparency will be provided currently. Later, Hopkin and

Williams hope to include certain solvents specially tested for infra-red spectroscopy.

Analytical certificates will be issued with each container of solvent and typical analyses will be published in the technical press from time to time so that prospective users may be in a position to assess the suitability of current production batches for their purposes.

Characteristic of some Spectrosol batches available at the present time are shown in the table below.

The certificates issued will comprise a table showing % transmission in a 1 cm. fused silica or quartz cell from the wavelength corresponding to at least 90% transmission down to either 200 μ m or 1% transmission, at 5 μ m intervals.

% Transmission (1 cm. cell against H₂O) at given wavelengths (μ m)

	400	300	275	255	250	240	235	230	225	220	215	210
Carbon tetrachloride	99	99	80	*	—	—	—	—	—	—	—	—
Chloroform	100	98	94	35	11	—	—	—	—	—	—	—
Cyclohexane	100	100	100	99	98	93	88	80	68	52	35	20
Ethyl acetate	100	95	90	27	1.5	—	—	—	—	—	—	—
Ethyl alcohol	100	99	99	95	92	86	80	73	66	56	46	34
n-Hexane	100	100	99	98	98	97	94	92	88	82	71	54
Methyl alcohol	100	98	97	95	93	87	81	73	64	53	41	27
Iso-octane	100	99	99	99	98	95	94	91	83	68	28.5	0.5
Iso-propyl alcohol	100	99	98	96	95	92	86	79	73	63	53	38

* 4.5 at 260 μ m.

Two New Viton Products from Du Pont

A NEW curing agent developed for Viton synthetic rubber and the first latex of Viton were announced in a paper presented by Mr. Robert R. Radcliff of the Du Pont Elastomers Laboratory, Wilmington, U.S., at a recent meeting of the London section, Institution of the Rubber Industry. Describing the properties of the two new materials, he stated that vulcanisates made with the curing agent had the same properties of outstanding temperature and chemical resistance as those obtained from previously used chemicals.

Viton, obtained from the combination of vinylidene fluoride and hexafluoropropylene, was introduced by Du Pont a year ago. The new curing agent, being marketed as LD-214, and known commercially as N,N'-dicinnamylidene 1,6 hexanediamine, is expected to provide a method for curing thick sections of Viton without sponging, and to provide parts with improved adhesion. It is readily dispersible in the rubber stock and, said Mr. Radcliff, provides excellent processing safety with very little tendency to scorch. LD-214 also has plasticising properties which will give smoother extrusions of Viton than previously possible.

The new storage-stable latex of Viton, LD-242, now available for commercial evaluation, shows promise in asbestos sheet. Mixed with the asbestos pulp, it imparts the qualities of Viton to the asbestos. Unlike material bonded with ordinary rubbers, asbestos saturated with this product retains its flexibility and tensile strength after exposure to high temperatures and many chemicals such as aliphatic and aromatic hydrocarbons, concentrated acids and bases, oxidising chemicals, and chlorinated hydrocarbons.

The potential of the new latex is just beginning to be explored. It may be useful for fire fighting suits or dipped items such as gloves.

New B.S. for Aqueous Solutions of H₂SO₄

A NEW edition of the British Standard for density-composition tables for aqueous solutions of sulphuric acid (B.S. 753, 1959) has just been published. The 50 pages of tables based on the 'international critical tables' gives density in g./ml. of the aqueous solution, mass in grammes of H₂SO₄ in 100g. of aqueous solution, and mass in grammes of H₂SO₄ in 1 litre of aqueous solution. The numerical data remain unchanged for the temperature range 10°C to 40°C and the density range 1.000 to 1.846.

Full instructions are given on the use of the tables in conjunction with the instruments—including the corrections to be applied in various circumstances, with worked examples. Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London W.1. Price 15s (postage extra to non-subscribers).

Analytical Review

RECENT DEVELOPMENTS IN ORGANIC ANALYSIS

CURRENT interest in organic compounds of boron for use in rocket fuels, polymers, resins and fungicides, etc., has stimulated research into methods for the analysis of boron in such materials. Thus a recent paper from an American source describes experiences with established methods and recommends a procedure which is said to be superior (1). It may be of interest to record these findings here.

Aqueous acidimetric titration of boron containing acids in the presence of an activating polyhydric alcohol such as mannitol gave satisfactory results for water soluble acids of boron, but such a method is obviously limited in scope. Decomposition of the compound by means of bromine water and subsequent titration in the presence of mannitol after pre-neutralisation yielded experimental difficulties which these authors were apparently unable to overcome. They met a similar obstacle in applying the alkaline-peroxide decomposition procedure and consequently abandoned it after modifying the existing procedure to suit experimental conditions.

Semi-micro Method

The semi-micro method which is finally recommended necessitates decomposition of the sample in a high pressure oxygen bomb which contains a small amount of water to absorb the boric acid. The carbon dioxide which is formed is gassed out with nitrogen and the solution is pre-titrated potentiometrically to pH 5.15 before addition of mannitol and titration back to the same pH with 0.05 N sodium hydroxide. This second titration corresponds to the boric acid formed during decomposition. Results by visual titration were found to be rather erratic. The method was applied to borazoles, boronates, boroxoles, borates, substituted boron halides and boro-silicon compounds.

Another recently described method for boron requires much simpler apparatus and less detailed experimental manipulation (2). In this procedure the compound is decomposed by burning in an oxygen-filled, soft-glass flask and the boric acid thus liberated is titrated in the same flask by the usual procedure which employs mannitol and visual indication of the end-point. Due to lack of available samples, this method was not applied to a wide range of materials, but there is no reason to doubt that it should have a reasonably wide range of application.

Metals in Organic Compounds.—The last mentioned paper also describes the determination of metals in organic compounds by EDTA titration subsequent to decomposition in an oxygen filled Pyrex flask. The metal oxides were absorbed

in N hydrochloric acid, the pH was adjusted to about 10 by addition of ammonia, excess EDTA was added and the excess determined by titration with a standard magnesium solution and with Solochrome Black 6B as indicator. Certain metals, e.g. nickel and gallium,

By

T. S. West, Ph.D.

This article reviews some recent developments in organic analysis. (1) The determination of boron by oxygen-bomb and oxygen-flask methods. (2) A simple method for determining certain metals in organic compounds. (3) The identification of halogens. (4) The detection and determination of polycyclic aromatic hydrocarbons.

formed insoluble oxides which were not readily dissolved, others, e.g., lead and bismuth, alloyed with the platinum wire which was used to hold the paper during combustion. While these restrictions limit the applicability of the method, the range can no doubt be extended by avoiding the use of platinum wire as support and, for example, substituting a silica spiral. There appears to be no reason why many other metals cannot be determined directly by this procedure and flame photometry could readily be applied to determine the alkali metals.

Detection of Halogens in Organic Compounds.—Many authors have recommended fluxes other than sodium for fusing organic compounds to test for the presence of halogens, sulphur and nitrogen on the grounds of lower probability of explosion. Such fluxes, e.g., zinc-sodium carbonate, magnesium-potassium carbonate, are reliable provided they are used at a sufficiently high temperature under the correct conditions. It is known, however, that the tests frequently fail due to non-adherence to the necessary conditions and indeed iodine can be lost by volatilisation due to heat evolved during neutralisation. Similarly the halogens can also be lost because of the copious evolution of carbon dioxide during neutralisation. Now, a new method has been described which employs zinc-lithium carbonate (3). This method has several attractive features. Thus lithium carbonate fuses at a much lower temperature and consequently fusion is much more readily accomplished. Moreover, the unreacted lithium carbonate can be centrifuged or filtered off after digestion with water. The low carbonate concentration in the filtrate (ca 1%) thus permits easy neutralisation, and the evo-

lution of gas is sparse. Many compounds were analysed, among them dye intermediates and dyestuffs with iodine and bromine in the ring, side chain or linked ionically.

A detailed working procedure is given; the method appears to be one worthy of serious consideration by analysts who have occasion to carry out such tests.

Polycyclic Aromatic Hydrocarbons.—Concentration of polycyclic aromatic hydrocarbons in combustion products such as smoke, soot and tar is generally very small. Consequently, methods for the identification and determination of these hydrocarbons must be preceded by efficient separation methods. In a recent paper in *Analytica Chimica Acta*, Lindsey (4) has contributed an interesting paper on this problem. The separation process is dependent on elution chromatography from specially activated and standardised alumina columns. The recommended solvent medium is dry cyclohexane. The degree of adsorption by the column varies greatly from naphthalene (weakly retained) through to coronene, so that the last fractions are eluted only slowly and are obtained in rather dilute solution. The addition of benzene to the solvent speeds up elution, but promotes considerable absorption of radiation below 260 mμ. An alternative measure is to use aliquots with two columns activated to a different degree for lower and higher fractions.

The U/V absorptiometric determination of the constituents in the eluate is considered briefly, and various methods for curve measurements are discussed. As a result of the standardisation of the chromatographic and absorptiometric procedures, tables of absorption peaks are given to facilitate the easy identification of over twenty trace compounds commonly found in combustion products. The method was applied to the qualitative and quantitative analysis of materials such as carbon black, soot, air solids, tobacco smoke, wood smoke, coal tar, combustion and pyrolysis products, vegetation, soil, tobacco, snuff, smoked food and surface drainage water.

REFERENCES

1. Kuck, J. A. and Grimm, E. C. *Microchem. J.*, 1959, 3, 35.
2. Belcher, R. Macdonald, A. M. G. and West, T. S. *Talanta*, 1958, 1, 408.
3. Gansel, E. M. *Microchem. J.*, 1959, 3, 91.
4. Lindsey, A. J. *Analyt. Chim. Acta*, 1959, 20, 175.

Sanatogen Plant to be Transferred to N. Ireland

FISONS LTD. are to transfer the manufacture of Sanatogen to Northern Ireland. The new plant will cover 20,000 sq. ft. and be on the site of the Fisons Milk Products factory at Coleraine.

Sanatogen is at present manufactured at Loughborough, but liquid milk supplies in the area are insufficient to meet present demand for the product. The transfer will be undertaken in two stages. Full production at Loughborough will go on until end-July. Then half the plant will shut down and transfer to Coleraine. It is anticipated that by the end of the year the transfer will be complete and that, by March 1960, the plant will be in full production.

SHEEHAN GAINS A.C.S. AWARD FOR SYNTHESIS OF PENICILLIN

FOR his achievements in synthesising penicillin two years ago and for research in the synthesis of peptides Dr. John C. Sheehan of the Massachusetts Institute of Technology will be awarded \$1,000 at the annual meeting of the American Chemical Society in Boston, 5 to 10 April. This award is given annually in recognition of "creative work in synthetic organic chemistry".

At the A.C.S. meeting Dr. Sheehan will report on further accomplishments in this field and also in the development of a selective method for synthesising peptides, using carbodiimide as a key reagent.

Dr. Sheehan reported at the CIBA Foundation conference in London in 1958 that he had produced 6-amino-penicillanic acid by total synthesis and had converted it into a variety of penicillins. He had succeeded in doing this by chemical means without resorting to the fermentation process.

"The British group (i.e. the Beecham workers), like our own team, are now engaged in a research programme to discover which, if any, of the chemically

modified penicillins will have medical advantages", Dr. Sheehan said. They have described "an interesting variant of the present commercial method of fermentation".

In his M.I.T. laboratory he and his co-workers had previously reported the synthesis of a biologically-active synthetic penicillin which differed from the natural penicillins only in the side chain, and two years ago using this general method Merck, Sharp and Dohme Research Laboratories, Rahway, New Jersey, prepared more than 10 synthetic penicillins which were all biologically active. All of the penicillins which can be prepared by the British method can also be prepared by the totally synthetic route, reports Dr. Sheehan, since both the British process and one of his synthetic routes go through the same intermediate, namely the 6-amino-penicillanic acid. He will report at the April A.C.S. meeting that his group has succeeded in converting a natural penicillin, Penicillin G, into this same intermediate.

There are now three methods, there-

fore, for the preparation of new penicillins. First, Sheehan's totally synthetic route which is capable of greater variations and can even alter the penicillin ring structure as well as the side chain but which appears to be the most expensive of the three routes. The second route is by removal of the side chain from a natural penicillin and replacement with a different side chain. The third method, reported by the British, is to interrupt the fermentation at the amino-penicillanic acid stage and add the side chain in a one-step chemical process. "On the basis of present information it is not possible to decide which of the latter two methods would be commercially advantageous for the production of a new penicillin", Dr. Sheehan has stated.

Dr. Sheehan's work has been supported by Bristol Laboratories of Syracuse, N.Y., which are now doing research to evaluate the penicillins.

Liquid Ammonia Tank is Onazote Insulated



Insulation of this sphere at the Flixborough, near Scunthorpe, plant of Nitrogen Fertilisers Ltd., has recently been completed by Onazote Insulation Co. Ltd., Mitcham Road, Croydon. Used for the storage of liquid ammonia at 10-15 p.s.i. gauge, the sphere operates down to -20°F. The vessel has been insulated with 7 in. of Onazote in four layers and is finished in bitumenised tape. Onazote, with its cellular construction was chosen because of its lightness and greater resistance to moisture penetration than cork.

S.C.I. Meeting on Possible Corrosion Congress

A meeting is to be held at 14 Belgrave Square, London S.W.1, on 20 April, at 3 p.m. to consider a proposal that an international congress on corrosion be sponsored by the Society of Chemical Industry in London in 1961. All persons interested in the proposal are invited to attend the meeting.

New Offices for Chas. Lennig

Charles Lennig and Co. (Great Britain) Ltd., are to erect an office block of about 75,000 sq. ft. at their works at Jarrow-on-Tyne.

Phenolic-type Resins Aid Resistance of GR-S Rubbers to Ageing

COMPARISON of GR-S rubber with natural rubber, say British Resin Products Ltd., Devonshire House, Piccadilly, London W.1, has shown that GR-S has better resistance to ageing and heat, but less tack, lower resilience and very low gum strength. These difficulties can be overcome, the company claim, by using Cellobond rubber reinforcing resins in GR-S compounds, and that compounds as hard as 99/100° B.S., but which are readily processable and have excellent moulding characteristics can be formed.

The Cellobond resins concerned are H.831, H.835 and H.832. Cellobond H.831 is a phenolic-type resin supplied in powder form. It contains hexamine, an aldehyde donor, and it hardens under the influence of heat. The resin can be readily incorporated into natural and synthetic rubber stocks, it is stated, conferring reinforcement and increased resistance to oxidation, petrol, oil, solvents and chemical attack over a wide range of resin/rubber ratios including those which give hard ebonites. Also the resin has been found to enhance electrical properties of GR-S stocks.

Cellobond H.835 is similar to H.831, but has a higher softening point (110°C against 90°C). Cellobond H.832 is a liquid phenolic-type resin which can be used as a processing aid and a tackifier. In the presence of aldehydes such as hexamine, the resin will thermoset during vulcanisation of the rubber to give reinforcements of hardness and tear strength.

With H.831 tensile strength is reinforced up to a maximum of 25 parts

resin per 100 GR-S, and modulus, tear and hardness are increased throughout the range of resin loadings. In the presence of a 50 part loading of HAF Black, the hardening effect of this resin is described as more marked (97°BS). Tensile strength is excellent and the elongation remains higher than 200%.

Resilience in black reinforced GR-S stocks is stated to be increased by using the Cellobond resins, flex cracking resistance to be improved and compression set to be reduced.

Technical note K207, obtainable from British Resin's information department, at the address stated above, gives full details and tables.

Surface Coating Resin Index

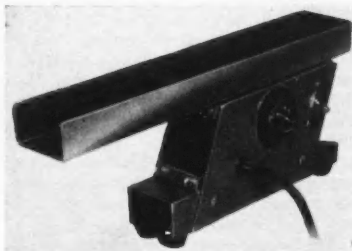
A new 'Surface Coating Resin Index' has been prepared jointly by the Surface Coating Resin Section, British Plastics Federation, and the Surface Coating Synthetic Resin Manufacturers' Association. The booklet replaces a similar index published in 1955 and gives the basic information on all British-made surface coating synthetic resins at present available to the paint, printing ink and allied trades. It is available on application to the British Plastics Federation, 47-48 Piccadilly, London W.1, or the Surface Coating Synthetic Resin Manufacturers' Association, 79-80 High Holborn, London W.C.1, price 5s, post free.

I.C.I.'s £10,000 for Reading

A sum of £10,000 has been donated by Imperial Chemical Industries Ltd. for Reading University's new building programme.

**MINIATURE
VIBRATORY
FEEDER**

LATEST addition to the range of magnetic vibratory feeders manufactured by **Sinex Engineering Co. Ltd.**, North Feltham Trading Estate, Middx., is a miniature model with a wide range of output, which can be varied between zero and 1,500 lb. per hour (for sand, or a free flowing material having a bulk density of about 100 lb. per cu. ft.) by turning a control knob. The unit is particularly suitable for laboratory applications or where accurate control of the feed is important at very low rates, and where space is limited. Its ability to give in-



Sinex miniature vibratory feeder

stantaneous cut-off enables it to be used in automatic weighing operations. The controller is normally mounted on one side of the casing but a separate control unit can be supplied.

The feeder contains no moving parts except springs; the feed trough can be totally enclosed and dustproofed when necessary. The trough, of stainless or mild steel, chromium-plated brass or plastics-coated steel, can be of any reasonable width and up to 12 in. long. The feeder consists of a heavy cast base to which are attached two leaf springs supporting the feed trough. Price ranges from £30 upwards.

**SHAW
MOISTURE
ALARM**

THE wet and dry limits of any material are set on the dial of the new Shaw moisture alarm, which will then light a lamp, ring a bell, or alter controls when the moisture alters beyond the required limits. The alarm indicates the amount of moisture by means of a dial reading, and two adjustable pointers coloured red and green are initially set to the desired control points by two external screws on the dial.

An external electrode makes a moisture measurement by means of a dielectric measurement at a frequency of 100 megacycles. Manufacturers are **Shaw Moisture Meters**, 31 Market Street, Bradford.

**GRAVINER
DETECTOR-
SUPPRESSOR**

THREE new items have been added to the range of equipment developed by the **Graviner Manufacturing Co. Ltd.**, 29 St. James's Street, London S.W.1, for explosion protection and suppression; these are Graviner combined detector and suppressor unit; high speed butterfly valve, and photoelectric explosion detector.

EQUIPMENT REVIEW

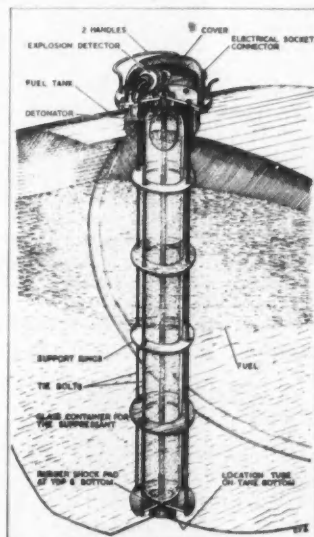
Chemical Plant: Laboratory Apparatus: Safety and Anti-corrosion Products

The detector and suppressor unit combines for the first time in one unit an explosion detector and a cylindrical suppressor. The unit is designed for single hole fixing and inerts and suppresses a volume of 800 gall. in less than 10 milliseconds. Developed for refueller explosion suppression, it is expected to find wide application in the dust explosion field.

The high speed butterfly valve has been developed as a more economic alternative

valve is also used in dust systems for explosion isolation.

The photoelectric explosion detector has been developed for use in explosion or protection systems where operating conditions do not allow the use of detection by pressure methods. It is available in air-cooled or water-cooled versions, for applications where the normal plant operating temperature exceeds 50°C and is suitable for use in gaseous or dust explosion risks. Arrangements are made for continuous cleaning of the viewing window, and the detector is self checking.



Graviner combined detector and suppressor unit

to the high speed isolation valve, and finds its chief application in air or gas systems. It is used to retain suppressant or inerting concentrations in systems where the normal air or gas flow would otherwise purge the system before fans or blowers can be brought to rest. The

**SEALING
MACHINE FOR
SACKS**

POLYTHENE bags, multi-wall paper sacks and cellulose film bags of any width and up to 40 in. in height can be sealed with the Sticla adhesive sealing machine. The Sticla seals hermetically and the makers, the **Thames Sack and Bag Co. Ltd.**, claim that the seal is stronger than the surrounding material. Absence of bunching reduces the size of containers. A ripcord for easy opening can be used. The maker's address is 28 City Road, London E.C.1.

**GOGGLE
CLEANING
CABINET**

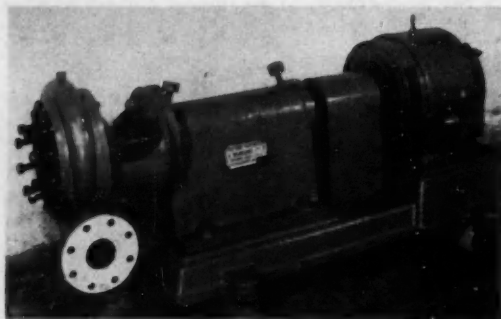
To prevent equipment for the protection of eyes from steaming or fogging the Fleming Safety Equipment Division of **J. and R. Fleming Ltd.**, 146 Clerkenwell Road, London E.C.1, has designed the Fleming lens cleaning and de-misting cabinet, No. 0063. The liquid, which is dispensed in a fine spray when a lever on either side of the cabinet is depressed, cleanses as it de-mists.

As a piece of really clean cloth is usually difficult to obtain in the average factory, tissues are provided in the cabinet, together with space for their disposal after use. Neither liquid nor tissues will damage plastics materials.

It is estimated that at least 12 goggles or spectacles can be treated at a cost of



Fleming lens cleaning and de-misting cabinet



Kestner's corrosive
liquors handling
pump

ld.; the operation of cleansing and demisting takes only a few seconds. It is felt that use of the cabinet will help encourage the wearing of safety goggles and spectacles.

LOCK'S pH NEUTRALISATION PLANT

A WORKING model of a pH neutralisation plant for trade effluents, was shown for the first time by **A. M. Lock and Co. Ltd.**, Oldham, at their third annual exhibition in Birmingham recently. This new fully automatic equipment is designed to meet the forthcoming restrictions. The new unit enables cyanide and chromate-bearing effluents to be controlled automatically with a pH value of 6.5-7.5.

In practice, the effluent is pumped through a continuous flow detector assembly, manufactured from an inert plastics material with the appropriate detector electrodes built into the continuous flow assemblies. The cyanide detector assembly generates a potential depending mainly upon the concentration of cyanide present, and the chromate detector assembly generates a high potential when chromate in the hexavalent state is present, and only a few millivolts when it is reduced to the trivalent state. This potential is electronically amplified and changed into an electrical current output of 0.1 mA and fed into a reaction controller.

For the treatment of cyanide, a sample of the effluent is pumped continuously through the detector assembly from the reaction vessel. When no cyanide is present a low potential is generated by the detector, and with a slight amount

of cyanide—0.1 p.p.m.—a rapid increase in potential is obtained. This rate of increase gradually falls off with increasing concentration.

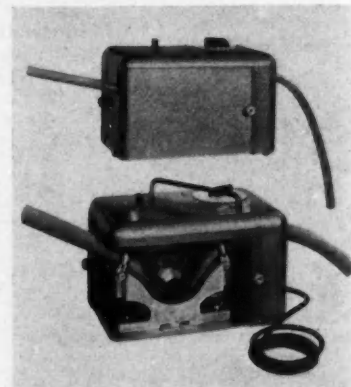
With chromates, in the hexavalent state, a potential of about 300 mV is generated, a figure that drops to less than 50 mV when the chromate is reduced to its trivalent state. In this case, the potential generated is not dependent on the concentration of chromate present in the effluent.

NEW FLOW INDUCER FOR LIQUIDS

THE new Watson-Marlow H.R. flow inducer is a means of inducing the flow of fluids, from slurries to gases, through pipes without the intervention of other devices such as non-return valves. A Fluon-lined pipe is offered in conjunc-

tion with the unit, giving a high capacity pump, in which the fluid contacts only the Fluon pipe, which is inert to chemicals, for a cost of under £100. Manufacturers are the **Watson-Marlow Air Pump Co.**, Marlow, Bucks.

The flexible pipe is clipped to a multi-curved track which is locked into the machine, when the central curve is concentric with a rotor bearing three rollers. As these rotate, the rollers pass over the pipe, flattening it against the track at the point of contact only. This 'flat' moves round the central curve of the track driving anything in the pipe before it. At the same time, restitution of the pipe behind the roller creates a powerful suction, drawing in more fluid to be pushed by the following roller.



Two views of the new flow inducer

tion with the unit, giving a high capacity pump, in which the fluid contacts only the Fluon pipe, which is inert to chemicals, for a cost of under £100. Manufacturers are the **Watson-Marlow Air Pump Co.**, Marlow, Bucks.

The flexible pipe is clipped to a multi-curved track which is locked into the machine, when the central curve is concentric with a rotor bearing three rollers. As these rotate, the rollers pass over the pipe, flattening it against the track at the point of contact only. This 'flat' moves round the central curve of the track driving anything in the pipe before it. At the same time, restitution of the pipe behind the roller creates a powerful suction, drawing in more fluid to be pushed by the following roller.

Flow is reversible and the direction is controlled by a three-position switch. The centre, upright, position is 'off' and flow is induced in the direction in which it is pushed. Flow rate is infinitely variable from a few c.c.'s per minute to about 500 gall. per hour, in a number of ways, so that great flexibility of use is possible.

Speed of the rotor is steplessly variable over the whole range 0-200 r.p.m. Pipes of any bore, from the smallest available up to about 1 in. can be used at will. The quantity passed during one revolution of the rotor is approximately the volume in 1 ft. of the pipe.

The bottom of the multi-curve track is tapered and its location on the machine base has a corresponding taper. The track can be locked in any position on this incline and the farther it is pushed up, the closer the gap between the rollers and the flow induction curve. This not only provides accommodation for differences in wall thickness between one pipe and another, but also allows for adjustment in the pressure exerted on the pipe by the rollers.

The multi-curve pipe track is the heart of the flow inducer. It has been carefully designed to give a positive flow induction over the central concave portion and full support to the pipe at either side without kinking or interfering with the flow. The only point at which even a large diameter tube is restricted is where the roller is actually pressing it against the track. The pipe follows a virtually straight path in both directions from the roller. As a result, the only limit to the size of pipe used in this compact unit is the width of the track itself. Besides providing adjustment for pressure and flow, the track is instantly removable altogether so that the pipe can be changed, cleaned or autoclaved.

PUMPS FOR CORROSIVE LIQUORS

WHILE satisfactory in achieving its main object of handling acid and other corrosive liquors, the Kestner horizontal range of acid pumps has recently been modified to give a series possessing several new advantages.

The new range of pumps has a specially rigid cast iron bearing assembly of robust construction, having no pockets in which corrosives can collect. The **Kestner Evaporator and Engineering Co. Ltd.**, 5 Grosvenor Gardens, London S.W.1, have made the bearings totally enclosed. The shafts are generously sized in order to reduce orbital movement of the impeller to an insignificant amount. This is an important consideration when using either glands or mechanical seals. The design also allows for maximum interchangeability between different contact materials, Keesbush or any other. The same basic bearing assembly may be used for V-rope drives or for direct motor drive. Either a packed gland, a type 10 Crane seal, or Flexibox seal can be used.

The new design is said to bestow versatility, in that component parts and materials of construction can be interchanged as desired.



pH neutralisation plant as shown at
Birmingham recently

I.C.I. Keep Pace with New Trends in Nuclear Metals

METALS DIVISION of I.C.I. is preparing to produce the 'new' metals for water-cooled nuclear reactors and is associated "with plans for yet other types". This is stated in 'Metals for Nuclear Energy', a new booklet published by the division which describes the part it has played—and the subsidiary Marston Excelsior Ltd.—since the first request was made at the end of 1940 to produce a metallic membrane for what turned out to be a diffusion plant for the separation of uranium 235 from the more abundant isotope 238.

The booklet describes the division's earliest work in this field and the intensive research and development work since carried out. So far a total of 75,000 uranium 'cans' have been supplied to Harwell. At present nearly 400 miles of Integron finned heat-exchanger tubes are being manufactured in mild steel for the nuclear power stations at Bradwell and Berkeley.

Describing the division's work on the 'new' metals, it is stated that aluminium, the earliest canning material, has a limited upper working temperature and so cannot

be used for sheathing in present-day gas-cooled power reactors. Recently the Aereal alloys, which contain nickel and iron, have been developed at Harwell. Their resistance to corrosion by hot water is sufficiently good to warrant larger-scale manufacturing experiments by I.C.I. on behalf of the Atomic Energy Authority. These have involved processing material made under normal commercial conditions and using special techniques, such as melting in vacuum. Research in progress might well lead to an aluminium alloy as a 'new' metal for commercial water-cooled reactors.

Because later versions of the gas-cooled reactor will work at temperatures that make Magnox (a magnesium alloy with small additions of beryllium and other materials) inadmissible, it is hoped that the development of the elaborate techniques needed for the processing of the highly toxic metal beryllium will make the metal available for canning, irrespective of the shape and size of fuel elements yet to be designed. Metals Division has for some time been working on this metal and is now constructing

the first European plant for melting and fabrication on a commercial scale.

I.C.I. expect to supply wrought zirconium products—some fully fabricated—for fuel support purposes in the new gas-cooled power station reactors now being built. There is no doubt, as its price is reduced, that zirconium should increasingly replace stainless steel sheathing in water-cooled reactors.

Describing the Dounreay fast-breeder reactor as "one of the most exciting experiments in the world," the booklet says it is designed to transmute thorium to uranium 233 or uranium 238 to plutonium. Working temperatures would be very high and so compatibility needs were stringent. Because neutrons would not be at a premium, concessions could be made on neutron capture cross-sections and the evidence suggested that attention must turn to niobium, vanadium and other 'new' metals. Niobium was the subject of active research and novel alloys that would have other than nuclear applications were likely to emerge.

Analytical Instruments Now Offering Full Process Automation

AUTOMATION in analysis was the subject of a joint meeting of the London Section, Royal Institute of Chemistry with the South Eastern Section of the Institute of Petroleum recently at the Medway College of Technology, Chatham. The lecturer was Mr. D. A. Patient, who discussed the design of automatic analytical instruments used for measurements on liquids.

He emphasised the need for a reliable valve which would cut off the flow of a liquid immediately and described the construction of a solenoid valve. Hypodermic syringe-type pipettes were capable of delivering accurately the required amounts of reagents and were reliable over long periods of time, as well as being rapid in action. An example was cited of an operation involving the addition of seven separate reagents which could be carried out at a rate of 30 tubes in 70 seconds per reagent.

Another operation, that of liquid/liquid extraction, was exemplified by an apparatus for the determination of uranium in which the liquid stream is sampled and the sample extracted with suitable reagent in one or more columns. The extract is then back-washed with ammonium thioglycollate which not only washes the uranium out of the solvent but also develops a colour which is measured automatically in an absorptiometer and the results recorded. Colour measurement in the absorptiometer is carried out by comparing the light beam after passage through a standard cell with that passing through a cell contain-

ing the sample. A photomultiplier passes an amplified current to a capacitor system which activates the recorder mechanism.

An automatic titrimeter which samples, titrates and records the answer in desired units was also described. This includes a proportioning device such that reagents of strengths differing by $\pm 10\%$ from standard may be used.

In a discussion period Mr. Patient agreed that any electrometric determination could be carried out e.g. redox titrations or conductivity measurements. Drift of pH meters could be checked by interposing a sample of known pH at regular intervals so that any error outside an acceptable tolerance would be noticed and an alarm sounded. Regarding change in function e.g. from say pH to redox titration, Mr. Patient pointed out that if this was foreseen the apparatus could be designed to cope with the change by simple switching, but adaption of an existing unit would be a little more difficult.

In many cases where expensive products were concerned (such as the uranium flow already mentioned) the apparatus could be said to pay for itself by preventing waste.

In reply to a comment that the use of automatic instruments was not 'automation' in the accepted sense Mr. Patient said that the signals obtained could be used as feedback to control a process and therefore full automation was possible, and, in fact, was being applied in various plants.

Chemical Prices were Stable in February

PRICE INDEX of the Board of Trade for chemicals and allied industries during February remained steady, as the following extract shows. For the classification 'general chemicals,' there was a rise of 1.1 compared with a year ago; the index for pyrites showed a slight rise over the year, while the figure for sulphur was down by more than 6 points. The index is based on a 1954 average of 100.

	Feb. 1958	Jan. 1959	Feb. 1959
<i>Commodities Produced in the U.K.</i>			
Chemical & allied industries			
Total sales ...	105.1	105.0*	105.1*
Home market sales ...	106.2	106.0*	106.1*
General chemicals ...	108.2	107.1*	107.1*
Pharmaceutical chemicals ...	83.7	82.4*	82.2*
Pharmaceutical preparations ...	103.6	101.1*	101.1*
Soap ...	119.0	126.6	126.7
Soapless detergents ...	102.9	104.4	104.4
Synthetic resins and plastics materials ...	94.7	91.0	91.0*
<i>Commodities Wholly or Partly Imported</i>			
Linseed oil, crude, naked, ex-works ...	133.5	120.2	114.5*
Palm oil, c.i.f., in bulk ...	104.2	100.6	100.6*
Whale oil, acid, soft, naked, ex-works ...	175.1	118.4	118.4*
Pyrites, c.i.f. U.K. ports ...	77.8	78.2	78.2*
Rubber, No. 1 R.S.S. one month future ...	114.6	125.7	126.1
Sulphur, crude (for acid making), c.i.f. ...	84.9	78.3	78.3

* Provisional figure

Prescribed Industrial Diseases

Some 15 sets of regulations dealing with the industrial diseases provisions of the industrial injuries insurance scheme are consolidated into one document from 31 March in the National Insurance (Industrial Injuries) Prescribed Diseases Regulations, 1959, S.I.1959, 467, obtainable from H.M. Stationery Office or through any bookseller, price 1s 3d. The consolidation in no way changes the effect of the regulations.

Overseas News

GRACE, PECHINEY AND FOSTER WHEELER UNITE TO OFFER UREA PROCESS

THREE well-known companies representing process development; plant engineering and construction; and production have entered a novel arrangement for the future sale of Pechiney urea process.

Pechiney of France, who pioneered the total recycle process by making urea from ammonia and carbon dioxide, using a neutral oil slurry to recycle unconverted raw material, will license their original know-how and rights through the international Foster Wheeler Corporation. The process will be commercially augmented by joining with the actual large-scale operating know-how and experience obtained over the past five years by W. R. Grace and Co., New York, one of the first licensees of the Pechiney process in the U.S.

The new arrangement will benefit companies interested in making a urea of high purity and low biuret content. The process, known as the Pechiney-Grace process, will incorporate all of the most recent advances in urea production and quality control developed at Grace Chemical Division's Memphis plant.

Since construction was completed in 1955, Grace engineers have simplified the basic synthesis design; experimented and developed important modifications to the system; improved evaporation and prilling techniques and added new purification and ammonia recovery systems. Currently, Grace with the assistance of Foster Wheeler are doubling the capacity of their 150-tons-per-day plant.

Firms obtaining a licence for the process through Foster Wheeler Corporation will benefit by the improvements in plant performance developed by Grace. Start-up difficulties will be minimised and in many cases virtually eliminated. Grace will also consider negotiating a separate agreement on a fee basis to train customers' personnel at their Memphis plant, also the supply of any special services such as furnishing production engineers to assist during start-up operations. (See also 'Distillates', p. 576.)

Swiss Firms to Make Pharmaceuticals in India

An Indo-Swiss company set up under the name of Roche Products Private Ltd. at the end of last month opened a plant near Bombay for the production of synthetic Vitamin A after investments totalling SFr.2 million (£167,000). During 1963 a larger plant will be opened on the same site at a cost of SFr.20 million (£1,670,000) for the production of special products of the Swiss associated company, Hoffman-La Roche A.G., Basle, as well as additional Vitamin A.

Another Swiss chemical concern,

Geigy, also of Basle, recently set up a similar part-subsidy in India under the name of Suhrid Geigy Private Ltd., for the production of pharmaceutical products of the Swiss concern, products of Farbenfabriken Bayer A.G., Leverkusen, West Germany, and some products under licence from Soviet firms.

Price Fixed for Algerian Natural Gas

The French Government has fixed the price of natural gas from the Hassi r'Mel deposits, Algeria, at Fr.3.50 (approximately 1d.) per cubic metre. This price is lower than that of natural gas in Metropolitan France and only half the price of power from traditional sources in Algeria at present. According to M. Delouvrier, Delegate-General in Algeria, the price fixed would not imply any Government subsidy.

Also announced is the decision to take the gas by pipeline to Bone to a power station to transform it into industrial power. Cost of construction of the station would be £15 million.

Yugoslav Fertiliser Output Rose 22% in 1958

During 1958, 295,429 tons of chemical fertilisers were produced in Yugoslavia, or about 22.4% more than was produced in 1957. Output of ammonia soda totalled 77,380 tons, or 7.3% more than in 1957. Some increases were also recorded as regards sulphuric acid and certain other chemicals. On the other hand outputs of nitric acid, caustic soda, calcium carbide, and copper sulphate were down.

C.M. Pharmaceutical Producers To Form Association

At a meeting in Milan last week representatives of the pharmaceutical industries of Italy, West Germany, Belgium, Holland and France decided to set up an organisation for pharmaceuticals production within the Common Market area, under whose auspices five study groups would explore problems connected with the industry. Inception committee of the organisation is to meet in Brussels on 23 April, and the organisation itself will have its first meeting in Paris on 22-23 June.

Latest U.S. Polythene Producer

National Distillers', U.S. Industrial Chemicals division have now brought their high-pressure polythene plant at Houston into operation. This will add 75 million lb. polythene to U.S. conventional polythene production. Plans are

also going ahead to double capacity at the site, thus bringing the total capacity of the unit up to 150 million lb. per year by late 1960. The company's annual high-pressure process potential would then total 250 million lb., the second highest in the field.

High pressure polythene is reported by National Distillers as a real sales boon to the company. Last year the polymer was the largest single item in their chemical sales. At the same time the company is continuing its pilot plant research on polypropylene and olefin copolymer. It claims to have a new process for low-pressure polythene, but according to the vice-president, because of current over-capacity of this polymer second highest in the field.

Witco Acquire Canadian Chemical Distributors

Witco Chemical Company Inc., New York, have purchased a controlling interest in P. N. Soden and Co. Ltd., Canadian chemical distributors. This will enable Witco to expand their chemical sales and manufacturing activities in Canada. P. N. Soden maintain offices and warehouses in both Montreal and Toronto areas.

Israeli-Brazil Agreement on Dicalcium Phosphate Project

An agreement has been signed in Tel Aviv between the State-controlled Israeli company Fertilisers and Chemicals Ltd., of Haifa, and Nitro Química, of Rio de Janeiro, Brazil, under which Israel will supply some of the plant, technical staff and technical aid for the building of a dicalcium phosphate works in Brazil. The same firm recently received an order from the French Krebs concern for a similar plant for erection in Belgium. Fertilisers and Chemicals are said to have worked out a new production process which has special advantages over existing methods.

New Burmese Import Concern for Pharmaceuticals

The Burmese Government has set up, with a capital of 2½ million kyats (about £183,000), an undertaking which will hold the monopoly for imports of drugs and medicines to Burma. Its name is Burma Drug House Ltd. All foreign companies or subsidiaries involved in export to Burma have been asked to register with the concern, which will work an allocation system.

Argentine Polythene Capacity

Capacity of the polythene plant to be built near Buenos Aires by Industrias Plasticas Argentinas Koppers S.A. (I.P.A.K.) is 15 million lb. a year and not 15,000 lb. as stated in 'Overseas News' on 21 March. The plant will be so designed that capacity can be readily stepped up to meet new demands. Koppers International C.A. will design and supervise erection of the new plant and will also provide operational and managerial services.

● **MR. J. McNICHOLAS** and **DR. C. H. MORTIMER, F.R.S.**, have been appointed members of the Water Pollution Research Board from 1 April. They succeed **PROFESSOR J. E. HARRIS** and **MR. A. HOLROYD**, whose terms of office have expired. Mr. McNicholas is general manager of the Manchester Rivers Department. Dr. Mortimer is director of the Marine Station, Millport, and secretary of the Scottish Marine Biological Association.

● **SIR HUGH BEAVER** (Arthur Guinness Son and Co. Ltd.) a member of the Colonial Development Corporation since December 1951 has been appointed deputy chairman for a term of one year from 1 April. Sir Hugh is president of the Federation of British Industries and the Institution of Chemical Engineers. **SIR NUTCOMBE HUME** succeeds **LORD REITH** as chairman of the corporation.

● **MR. P. D. O'BRIEN**, chairman and managing director of Laporte Chemicals Ltd., Luton, sailed from Southampton in the *Queen Elizabeth* for New York on 26 March.

● **MR. J. K. HOWARTH**, **MR. D. H. LYNCH** and **MR. C. D. MOORE** have been appointed to the board of Glovers (Chemicals) Ltd., Wortley Low Mills, Wortley, Leeds. **MR. J. HOLDSWORTH** has been appointed secretary.

● **DR. M. W. ROBERTS, B.Sc., Ph.D.**, has been appointed a lecturer in physical chemistry at Queen's University, Belfast.



J. A. Eggleston (left), Boots Scottish divisional analyst, who as stated last week retired on 1 April. Right is **J. S. Brough** who, as also announced last week, has joined Humphreys and Glasgow Ltd. as technical director and general manager

● **MR. D. W. HAWKINS**, a former director and general manager of Dunlop Plantations Ltd., has been appointed to the main board of the Dunlop Rubber Co. Since February of last year he has been controller of the company's Materials Supply Division.

● **PROFESSOR DEREK HAROLD RICHARD BARTON, F.R.S.**, Professor of Organic Chemistry at Imperial College of Science and Technology, London, since September 1957, has been awarded the first Roger Adams award in organic chemistry, the American Chemical Society has announced. He will receive the award during the national organic chemistry symposium in Seattle on 1 June. Professor Barton's field is theoretical and

PEOPLE in the news

natural product chemistry.

The Roger Adams award, which is a biennial one, consists of a gold medal and \$5,000, and is sponsored by two non-profit making chemical publications *Organic Reactions* and *Organic Synthesis*.

● **MR. K. L. BUTCHER, B.Sc.**, Brotherton lecturer in chemical engineering, Leeds University, has been promoted senior lecturer from 1 October. **DR. W. RIGBY, B.Sc., Ph.D.**, has been appointed a lecturer in the Department of Organic Chemistry, also from 1 October.

● **MR. R. L. FENWICK**, who has been appointed field manager for the U.K. by Quickfit and Quartz Ltd., Stone, Staffs, manufacturers of interchangeable laboratory glassware, has been with the company for six years. He will lead the firm's team of sales representatives in outside sales and operations in the home market.

● **DR. T. MALKIN, Ph.D., D.Sc., F.R.I.C.**, of the Chemistry Department, Bristol University, has been re-elected chairman of the Oils and Fats Group, Society of Chemical Industry, for the year 1959-60. Other officers, who will take office after the S.C.I. annual meeting, are: vice-chairman, **MR. P. N. WILLIAMS**, immediate past-chairman, **DR. J. A. LOVERN**; hon. treasurer, **MR. N. D. SYLVESTER**; hon. recorder, **DR. N. W. HANSON**; hon. secretary, **DR. H. JASPERSON**, research department, J. Bibby and Sons Ltd., King Edward Street, Liverpool 3.

● **MR. G. L. BAILEY, C.B.E., M.Sc.**, director of the British Non-Ferrous Metals Research Association, has been elected president of the Institute of Metals. Other officers elected at the recent annual meeting were: Past-president, **MARSHALL OF THE ROYAL AIR FORCE**, **LORD TEDDER**, chairman, Standard Motor Co. Ltd.; vice-presidents, **DR. HUGH FORD, D.Sc., Ph.D.**, professor of applied mechanics, Imperial College, **MR. E. H. JONES, A.R.I.C.**, joint managing director, Capper Pass and Son, Ltd., North Ferriby, and **DR. H. O'NEILL, D.Sc.**, professor of metallurgy, University College of Swansea; hon. treasurer, **MR. D. P. C. NEAVE, M.A.**, director, British-American Metals Co. Ltd., Capper Pass and Son, Ltd., etc.; ordinary members of council, **DR. W. O. ALEXANDER, B.Sc.**,

Ph.D., assistant research manager, I.C.I., Metals Division, Birmingham, **DR. N. P. ALLEN, D.Sc., F.R.S.**, superintendent, Metallurgy Division, National Physical Laboratory, Teddington, **MR. F. DICKINSON**, manager, development and research department, Mond Nickel Co. Ltd., London; and **MR. L. ROTHERHAM, M.Sc.**, research member, Central Electricity Generating Board.

● **MR. OSMAN P. MARLAND** has been appointed sole managing director of E. Griffiths, Hughes from 31 March. **MR. CECIL B. GREEN**, joint managing director, is retiring from active work and as joint managing director, but is retaining the chairmanship of the company and of Griffiths Hughes Proprietaries.

● **MR. GEORGE WILLIAM DUNKLEY, O.B.E.**, has been appointed a director of Westinghouse Brake and Signal Co. Ltd., 82 York Way, London W.1.

● **MR. WILLIAM A. WOODCOCK** has been appointed vice-president and general sales manager, chemicals and plastics, of the Union Carbide International Co., a division of the Union Carbide Corporation of the U.S.

● **MR. R. B. FOSTER**, demonstrator in biochemistry at Oxford and lecturer of Wadham College, Oxford, has been appointed to the Chair of Chemistry in relation to Medicine at Edinburgh University. Mr. Fisher succeeds **PROFESSOR G. F. MARRIAN, F.R.S.**, who resigns the chair on 30 September next.

● **MR. EDWIN ROLFE**, head of the Lancashire branch of Ciba Clayton Ltd., was one of the employees who received a gold watch to mark 25 years' service. Others included **MR. F. A. CHEETHAM** (a T.G.W.U. national executive member), and **MR. A. SEATON** (past-president of the Chemical Workers' Union), both of whom have been process operators with the Clayton Aniline Co. for 25 years. Presentations were made by **SIR ARTHUR VERE HARVEY**, chairman of Clayton Aniline and of the CIBA Organisation in the U.K. A £6 million development programme is now under way for Clayton Aniline, while Ciba Clayton also have new construction in hand with extensions to their technical service laboratories.



L. to r., Edwin Rolfe, Sir Arthur Vere Harvey and G. H. Carnall, managing director, Ciba Clayton Ltd. and a director of Clayton-Aniline

TRADE NOTES

New E-Mil Products

New E-Mil products and designs are listed in Supplement No. 2 to the catalogue of H. J. Elliott Ltd., E-Mil Works, Treforest, Glam. These include micro measuring pipettes, rapid dispensers, separating funnels with unbreakable stoppers, burettes with plastics stopcocks, a modified differential thermometer, ultra-micro pipettes, etc. The Treamic process, which makes permanent the colour filling in etched graduations, is being extended to E-Mil Gold-line graduated pipettes. It is stated that the firm's 1957 price list is still in force, no price changes having been made since then.

Firth Cleveland Pumps

The Firth Cleveland Group has been enlarged by the addition to the group of Firth Cleveland Pumps Ltd. The company was previously known as Hill-Barnes (Pumps) Ltd. Mr. C. W. Hayward is chairman and joint managing director, and Mr. R. W. Hill, managing director of the former company, remains as joint managing director. Mr. E. S. Mead, Mr. L. G. Oxford and Mr. S. H. Goss have also been appointed to the board. The company will operate from Field Head Works, Markfield, Leics. The London sales office will be established at Stornoway House, St. James's, London S.W.1.

Firth Cleveland Pumps Ltd. will continue the manufacture of self-priming centrifugal pumps under licence to the design of the Barnes Manufacturing Co., Mansfield, Ohio. The licence covers the manufacture and sale throughout the world (except the U.S. and Mexico) of the entire Barnes range. These pumps will be marketed in future under the name of Firth Cleveland pumps.

D.C.L. Magnetic Oxygen Analyser

The Distillers Company Ltd. have granted to Servomex Controls Ltd. a licence to manufacture the 'null balance' magnetic oxygen analyser which is the subject of D.C.L. patents. This instrument, which instantaneously measures the oxygen content of gas streams by means of the paramagnetic effect, has been developed for industrial process control and is already installed in a number of chemical plants. Robustness, shock resistance and general stability have been obtained without reducing the accuracy and fast response needed for effective control.

Sales and service for the analyser will be handled by a newly formed department of Servomex Controls, at Crowborough, Sussex (Crowborough 3566).

New Towers Equipment

Among new equipment described in the latest issue of *Towers Laboratory News* (J. W. Towers and Co. Ltd., Widnes) are aperiodic balances, electric furnaces for temperatures up to 1,000°C, vacuum pipeline systems, Alnor dewpoint meter, thermometer reader and a range of viscometers to B.S. 188-1957. Copies are available from the company.

Swartwout Process Controls

Elliott-Automation Ltd. have formed a new subsidiary, the Swartwout Co. Ltd., to manufacture and sell the all electronic control systems for the process indus-

tries, heating and ventilating and for power station instrumentation (both atomic and conventional) developed by the Swartwout Co., Cleveland, Ohio. Elliotts entered into an agreement with U.S. Swartwout two years ago. Since then business in Swartwout systems, which are sold in America under the trade name 'Autronic,' has so expanded that Elliotts have found it desirable to form this new company to handle it, particularly in the export field.

New Tableting Service

New experimental laboratory and showrooms have been made available by Manesty Machines Ltd., Liverpool 24, under the control of Mr. K. W. Hargrove, M.P.S. Facilities are available for testing products on all the tablet machines, mixers, granulators, comminutors, and coating pans in the Manesty range. Separate rooms are available for mixing, granulating, and compressing, including experimental work on the DryCota combined tablet making and compression coating machine and the Manesty Fitzmill comminuting machine.

Laboratory Chemicals Listed

Middleton and Co. Ltd., Middlesbrough, who this year celebrate their centenary, have published a new booklet entitled 'One-hundred—Not Out!' It lists the chemicals and laboratory apparatus available, including the products of Hopkins and Williams, B.D.H., M. and B., and I.C.I.

Arcon Buildings

Because of the growth in demand for Arcon buildings in the U.K., a new company, Taylor Woodrow (Arcon) Ltd., has been formed to deal solely with home trade. The new company is a subsidiary of the Taylor Woodrow Group. 450 contracts have been carried out in the U.K.

Market Reports

INDUSTRIAL CHEMICALS CONTINUE FIRM

LONDON With few exceptions price conditions throughout the industrial chemicals market have been notably steady for some time past, and the undertone remains firm. New home business during the short holiday week has been reasonably good and fairly well spread, although buyers are hesitant to enter into long term commitments. The call for agricultural chemicals is up to the seasonal level.

Export trade continues on a steady scale with a good flow of fresh inquiry in circulation. In the coal tar products market, a better activity is reported for crude and refined tar, and pitch, creosote oil and cresylic acid are in moderate request.

Effective from 31 March, the prices of zinc oxide have been reduced by 30s to the following: white seal, 2-ton lots, delivered, £99 per ton; green seal, £97 per ton; red seal, £94 per ton.

MANCHESTER As usual at this time of the year, the Manchester market

totalling in area nearly 6 million sq. ft., and ranging from the supply of single buildings to complete production plants or depots. The number of industries served has been varied widely, and includes the chemical and allied fields.

Centre-line Indicator-controller

List 28 of the Cambridge Instrument Co. Ltd., 13 Grosvenor Place, London S.W.1, describes a new instrument, a centre-line indicator-controller incorporating a novel display of the desired and measured values. When the pointer lines up with a fixed datum on the centre line of the scale the plant is "on control" and any change in this condition is immediately visible, even from distances at which scale graduations cannot be read. It is supplied for either on-off or time-modulated 3-term control.

List 144/A, Gas analysers—general principles, deals with some of the technical problems associated with gas analysis by the thermal conductivity method. It gives performance data on the Cambridge katharometer and includes notes on the types of measurement available and on the possible sources of error.

Chemstrand's Acrilan Prices

Chemstrand Ltd., makers of Acrilan acrylic fibre, announce that with the start of commercial scale production at Coleraine, Northern Ireland, the fibre in both staple and low form will be sold 'delivery free in Great Britain and Ireland,' the company bearing transport costs to any customers in these countries. There is no change in prices for standard Acrilan fibre, but the current charges of 9s 4d per lb. for 2 denier, and 9s per lb. for 2.5, 3, 4, 5, 8 or 15 denier, will include delivery to any customer's address in Britain and Ireland.

Annual capacity of the Coleraine plant is 10 million lb. a year of Acrilan, not 110 million lb., as stated in *CHEMICAL AGE*, 7 March, p. 397.

for heavy chemical products has been essentially of a holiday nature and this has been reflected during the past week in a partial interruption of deliveries against existing contracts and much quieter conditions as regards replacement business. An early return to more or less normal trading is confidently expected. The fertiliser and tar products trades have also been quieter so far as the actual movement into consumption is concerned.

GLASGOW A rather more active week's trading is reported from the Scottish heavy chemical market. Demands have again been varied and well maintained, between spot and contract requirements, with quantities involved at steady levels. Prices have continued firm, showing little change with the exception of metal derivatives.

Export business remains steady, while for agricultural chemicals there is considerable interest in demands against seasonable requirements.

Commercial News

Aspro-Nicholas

Mr. M. A. Nicholas, chairman of Aspro-Nicholas, reports that the December quarter was a period of consolidation and reorganisation following the acquisition of Clinical Products. Apart from that, the quarter was a normal one. The company have declared a third quarterly interim dividend of 6%. The total dividend for 1958 was 24%.

Joseph Crosfield

Net profit for 1958 of Joseph Crosfield and Sons was £887,793 (£883,349). Dividend is 25%, tax free (same). Fixed assets total £4,507,345 (£4,063,783), and net current assets £6,068,145 (£6,524,726). The major rebuilding programme announced in 1956 is proceeding according to plan—the first stage, estimated to cost £1 million, should be completed by end-June, the target date.

I.C.I.

While group sales of Imperial Chemical Industries Ltd. were unchanged at £463 million for 1958, income before tax, contracted from £55.1 million to £44.5 million, after an extra £5.1 million for depreciation. Deducting £20.7 million against £26.3 million for tax, the net profit is nearly £5 million down at £23.85 million (£28.81 million). There is £21.7 million, against £26.8 million, applicable to the parent.

Appropriations are down from £11.2 million to £5.7 million, and the ordinary dividend takes nearly £1 million more at £10.9 million.

A final dividend of 5½% is declared which makes a total of 8% for the year. This is the same as the 1957 payment of 12%, after adjusting for the one-for-two scrip issue.

Reichhold Chemicals

A final dividend of 12½% is announced by Reichhold Chemicals Ltd., on a capital increased by a one-for-three scrip issue to £625,868, making the equivalent of 18½% for 1958 against 15%.

Group net profit of £180,583 compares with £138,403; after tax of £214,601 (£177,931). £100,000 (£75,000) is being placed to general reserve. The ordinary dividend takes £65,227 (£53,982).

United Indigo

Approval has been given to resolutions authorising the repayment of 2s 6d on each 7s 6d preference share in United Indigo and Chemical Co., and 8d on each 2s ordinary share.

Mr. G. N. C. Flint, chairman, referring to offers made to certain shareholders, stated that the board regarded the value of the company at a higher rate. On realisation of assets in winding up he estimated that around £175,000 would be available for distribution against the bid of approximately £130,000.

- **Crosfield Profits and Dividend Maintained**
- **I.C.I.'s Net Profit Down by £5 million**
- **Reichhold Group Profit Up by £42,000**
- **United Indigo's Future to be Decided in June**

The reconstructed board had spent a lot of time assessing the value of the business, Mr. Flint indicated, and had agreed that there should be a change of management at the very top. A decision would have to be made following the forthcoming accounts to the end of June as to whether the company should be wound up or should continue in business. It was estimated that a loss of about £5,000 would be incurred during the year, but Mr. Flint believed that by the end of the next financial period it should be possible to be working on a profitable basis.

Canadian Chemical and Cellulose

Substantially improved operations are reported by Canadian Chemical and Cellulose Ltd. for 1958. A net loss of \$103,662 after all charges is shown compared with net loss of \$3,660,992 in 1957. The second half of the year showed a profit of \$1,111,721. Increased sales volume and more efficient operations were the major factors contributing to the improved results. Net sales at \$41,950,215 were up 18%. Operating profit for the year, before interest and non-cash charges was \$9,679,470 (\$6,025,919).

Europa Chemie

On 18 March sales began on the Swiss share markets of SFrs.100 shares of the new Europa Chemie concern (see CHEMICAL AGE, 21 March, p. 515). Some 84 companies in 10 countries—the Common Market block, plus the U.K., Switzerland, Norway and Austria—are interested in the new international organisation. British firms interested are: Imperial Chemical Industries Ltd., Albright and Wilson, Laporte Industries, Fisons, Reichhold Chemicals, Courtaulds, Monsanto Chemicals and the Distillers Company.

Montecatini

The Montecatini Co., Italy, propose to issue a \$10 million bond loan in the U.S. this year. This loan would be used for industrial developments of the company in the U.S.

At a meeting to be held on 28 April the issue of a 30,000 million lire bond loan in Italy will also be proposed.

Net profit for 1958 is 10,847.7 million lire (11,589.8 million) and the dividend is being maintained at 115 lire per share, by addition to net profit of 1,000 million lire from reserves.

NEW COMPANIES

CAMPBELL MIXERS LTD. Cap. £3,000. Consulting, designing and contracting engineers to the chemical, petroleum,

plastics, rubber, textile and allied industries and also allied industries in respect of mixing equipment. At no time shall the company hold itself out as carrying on business in succession to Campbell and Co. (Manchester) Ltd. (in liquidation). Directors: Colin Campbell, Evelyn Jones. Reg. office: 12 St. Ann's Square, Manchester 2.

ROBINSON (NEWTON HEATH) LTD. Cap. £5,000. To acquire part of the business of Robinson (Newton Heath) Ltd. (in voluntary liquidation) and to carry on the business of manufacturers and importers of and dealers in chemical, pharmaceutical preparations and articles, compounds, etc. Subscribers: N. Wilkinson and S. Wilkinson, chemical manufacturers. Reg. office: Dudley Hill Chemical Works, Dudley Hill, Bradford.

CRYSTALAB LTD. Cap. £100 To devise manufacture, develop and sell water softeners and conditioners, demineralisers and processes for the softening, purification or treatment of water, etc. Directors: S. I. Ward and J. E. Ward (both of the U.S.) and D. W. Brewer and J. F. Zwicky. Reg. office: Salisbury House, London Wall, London E.C.2.

F. W. WILES LTD. Cap. £1000. To acquire the business of Hart and Co. carrier of 1 Dynevor Road, Stoke Newington; to carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: F. W. and R. Wiles. Reg. office: 1a Dynevor Road, Stoke Newington, N.16.

INCREASE OF CAPITAL

HYDROL CHEMICAL CO LTD., 10, New Court, Lincoln's Inn, W.C.2. Increased by £18,000 in £1, beyond the registered capital of £2,000.

LONDON GAZETTE Voluntary Winding-up

Notice of voluntary liquidation is purely formal and does not imply insolvency. It is frequently for purposes of internal reorganisation.

F. C. DEVON AND CO. LTD., chemical merchants, reg. office, 17 Philpot Lane, London E.C.3. By special resolution, 26 February. E. J. R. Holder, 80 Bishopsgate, London E.C.2, appointed liquidator.

ROBINSON (NEWTON HEATH) LTD., chemical manufacturers, regd. office, Dudley Hill Chemical Works, Bradford. By special resolution to reconstruct the company, 2 March. P. C. Cardno, Mart's Bank Chambers, Tyrrel Street, Bradford, appointed liquidator.

S. STONIER LTD., chemical manufacturers and merchants, reg. office, The Mill, Holmes Chapel Road, Congleton, Cheshire. By extraordinary resolution, 29 January. Percy J. Snow, 17 Albion Street, Stoke-on-Trent, appointed liquidator.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On sale 13 May

Recovery of tetracycline. Bristol Laboratories Ltd. 779 290
Dispersions of colour couplers for use in light-sensitive silver salt emulsions. Kodak Ltd. 791 219

ACCEPTANCES

Open to public inspection 21 May

Apparatus for measuring the temperature of fluids in pipes. Superheater Co. Ltd., and Brittin, A. F. 813 781
Apparatus for the measurement of optical density. National Research Development Corp. 813 481
Moulding of polyester resins. Trylon Ltd. 813 535
Vessels. Whessoe Ltd. 813 621
Vessels. Whessoe Ltd., and Woodhall, E. H. 813 622
Colouration of textile materials. British Celanese Ltd. [Cognate application 14 798.] 813 610 & 813 611
Coated glass fibres. Owens-Corning Fiberglass Corp. 813 601
Combustible gas production. Power-Gas Corp. Ltd. 813 506
Substituted 2:3-diphenyl-1 : dioxo-tetrahydrophthalazines and a process for preparing them. Farbwerke Hoechst A.G. 813 507
Stabilisation of oxidisable compositions. Eastman Kodak Co. 813 538
Manufacture of sheets of polymers of olefinic compounds free from plasticisers. Farbwerke Hoechst A.G. 813 570
Thermal treatment of finely divided substances. Pulp & Paper Research Institute of Canada. 813 632
Di-imidazole derivatives and process for their manufacture. Ciba Ltd. 813 771
Hardening of cellulose acetate precipitates. Celanese Corp. of America 813 625
Production of organic compounds with aliphatic conjugated unsaturated linkages. Badische Anilin- & Soda-Fabrik A.G. 813 539
Photographic materials and in light-sensitive polymeric compounds therefor. Kodak Ltd. 813 604 & 813 605
Process for coating textile filaments or threads. Whiffen & Sons Ltd. 813 790
Plant for the continuous manufacture of fat-impregnated leather. Svit, Narodni Polnik. 813 691
Mixed fertilisers. Wintershall, A. G. 813 805
Preparing glyoxalated compounds of starch. Bozel-Maetra Soc. Industrielle De Produits Chimiques. 813 541
Collapsible tanks. Unthank, D. G., and Silley, H. A. J. 813 542
Solvents for natural resins. Imperial Chemical Industries Ltd. 813 807
Herbicidal compositions. Imperial Chemical Industries Ltd. 813 531
Benzimidazolylbenzenes. Sterling Drug Inc. 813 543
Polymerisation of unsaturated hydrocarbons. Imperial Chemical Industries Ltd. 813 793
Electrically heated tunnel kiln with a reducing gas atmosphere for part of the heating zone. Brown, Boveri & Cie. A.G. 813 513
Lubricant composition. Texaco Development Corp. 813 484
Treatment of regenerated cellulose textile materials. Courtaulds Inc. 813 794

Antibiotic compositions. Merck & Co. Inc. 813 485
Preparation of riboflavin analogues. Armour & Co. 813 545
Carbon electrodes. Diamond Alkali Co. 813 515
Metallisable disazo dyestuffs, complex copper compounds thereof and their use. Geigy, A.G., J. R. 813 646
Cellulose ester materials. Celanese Corp. of America. 813 516
Diazotisable amine compositions. General Aniline & Film Corp. 813 486
Arsenic xanthates, their preparation, and parasiticidal compositions produced therefrom. Montecatini Soc. Generale per L'Industria Mineraria e Chimica. 813 795
Cationic perm-selective membranes, and the process of producing them. South African Council for Scientific & Industrial Research. 813 606
Electrodialysis. South African Council for Scientific & Industrial Research. 813 607
Titanium base alloys. Mallory-Sharon Metals Corp. 813 549
Preparation of steroid substances. Glaxo Laboratories Ltd. 813 756
Controlling metal melting process. Max-Planck-Institut für Eisenforschung. 813 727
Wax coating compositions. Union Carbide Corp. 813 812
Method of making pellets coated with a finely divided material. G & A Laboratories Inc. 813 552
Aqueous dispersions of polymerisation products of ethylene. Badische Anilin- & Soda-Fabrik A.G. 813 814
Production of polyacrylonitrile threads, fibres, filaments and the like. Courtaulds Ltd. 813 815
Methods of producing vitamin A. Philips Gloeilampenfabrieken N.V. 813 517
Production of polyhydroxy ethers having an action similar to curare. Badische Anilin- & Soda-Fabrik A.G. 813 758
Apparatus for the distribution of gases. British Titan Products Co. Ltd. [Addition to 794 666.] 813 489
Production of tertiary acetylenic alcohols. Distillers Co. Ltd. 813 490
Radiation intensity measuring apparatus. Atomic Energy of Canada Ltd. 813 491
Production of polymerisation products of olefinically unsaturated hydrocarbons. Badische Anilin- & Soda-Fabrik A.G. 813 796
Polymerisation of ethylene. Soc. Des Usines Chimiques Rhone-Poulenc. 813 797
Adhesive compositions. American Siskalkraft Corp. 813 655
Testing of water for free and combined chlorine. Palin, A. T. 813 493
Process for preparing nickel carbonyl. Montecatini Soc. Generale per L'Industria Mineraria e Chimica. 813 819
Ethers of polyoxyalkylene glycols. Dow Chemical Co. 813 495
Catalytic polymerisation of α -mono-olefins such as ethylene to solid polymers. Eastman Kodak Co. 813 798
Aerosol compositions. Adair, H. J. 813 767
Recovery of the antibiotic nistocetin from a solution thereof. Abbott Laboratories. 813 559
Cathodic protection system and anode therefor. Dow Chemical Co. 813 657
Removal of dust particles from gases. Metropolitan-Vickers Electrical Co. Ltd. 813 594
Substituted-1:2-dihydro-1:3:5-triazines. Sterling Drug, Inc. 813 560
Acetylene. British Oxygen Co. Ltd. 813 562
4:4'-Dipridyl compounds and compositions containing them. Imperial Chemical Industries Ltd. [Divided out of 813 531.] 813 532
Organosilicon compounds. General Electric Co. 813 520
2-(β -Amino-ethyl)-5-hydroxy-indole and a process for the preparation thereof. Geigy A.-G., J. R. 813 777
Process for the production of metals and non-metals. National Distillers & Chemical Corp. 813 663
Ion retardation method of separating chloride and chlorate ions from concentrated alkali metal hydroxide solutions. Dow Chemical Co. 813 523
Quaternary aminoacrylphenothiazines. Astra: Apotekarnes Kemiska Fabriker A.B. 813 778
Method of manufacturing semiconductor crystals. Rauland Corp. 813 600
Derivatives of nicotinic acid and a process for the production thereof. Krugmann & Co. 813 524

Chloroprene polymers containing a pyrimidine accelerator. Vanderbilt Co. Inc., R. T. 813 779
Piperazine derivatives and the production thereof. Nordmark-Werke G.m.b.H. 813 473
Diazacyclobutane compounds and a process for their production. Geigy A.G., J. R. 813 474
Treatment of flowable materials. Celanese Corp. of America. [Divided out of 813 625.] 813 626
Applying metal members to plastic articles. Raphaels Ltd. 813 475
Fire extinguishing compositions. Diamond Alkali Co. 813 476
Process and apparatus for melting polyamide shreds. Farbenfabriken Bayer A.G. 813 527
Thiocarboxylic acid esters. Farbenfabriken Bayer A.G. 813 528
Apparatus for discharging a predetermined amount of a liquid. Tarukawa, T. 813 674
Portable water-distillation apparatus. Eastwood Plastics Ltd. 813 498
Steroidal compounds. Searle & Co., G. D. 813 529
Preparation of gelatinised starches. Duintjer Wilkens Meihuizen & Co. N.V. 813 500
Process for producing trinitroalkylamides. Nitroglycerine A.G. 813 477
3, 3'- β -isoxazole. Du Pont de Nemours & Co., E. I. 813 679
Process for preparing organotin compounds. Metal & Thermit Corp. 813 479
Fungicides. Merck A.G., E. 813 740
Coated glass fibres. Owens-Corning Fiberglass Corp. [Divided out of 813 601.] 813 602 & 813 603

DIARY DATES

MONDAY 4 APRIL

C.S.—London: Univ. College and Friends' House. International conference on co-ordination chemistry. Until 11 April.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. 'European free trade area or common market?' by W. A. M. Edwards.

TUESDAY 7 APRIL

Factory Equipment Exhibition—London: Earls Court. Until 17 April.
S.C.I.—London: 14 Belgrave Sq., S.W.1, 6.30 p.m. 'Applications of gas liquid chromatography in a plastics analytical dept.' by Dr. J. Haslam; 'Differential thermal analysis of some high polymers', by C. D. D'Oyly-Watkins, G. L. Palmer and C. M. Robertson.

WEDNESDAY 8 APRIL

C.S.—London: Friends' House, Euston Rd., 10.30 a.m. Presidential address: 'Some inorganic polymers', by Prof. H. J. Emeleus. A.g.m. at 9.30 a.m.
Inst. Metal Finishing—Brighton: Hotel Metropole. Annual conference. Until 11 April.
Plastics Inst.—Cardiff: Angel Hotel, 6.30 p.m. 'Newer processes for treatment of p.v.c.', by I. Phillips.
R.I.C.—Luton: Coll. of Further Education, Park Sq., 8 p.m. 'Modern developments in industrial ion-exchange processes', by Dr. T. V. Arden.
S.A.C.—London: 'Feathers', Tudor St., 6.30 p.m. Review meeting of Microchemistry Group.
S.A.C.—Salisbury: Cathedral Hotel, 7.45 p.m. 'Advantages and disadvantages of visual colorimetry', by G. J. Chamberlin.

THURSDAY 9 APRIL

Liverpool Metallurgical Soc.—Liverpool: Dept. of Metallurgy, Univ., 7 p.m. 'Boron in steel', by F. B. Pickering, followed by a.g.m.
S.A.C.—Birmingham: Mason Theatre, Univ., 6.30 p.m. 'Analytical chemistry in glass manufacture', by J. Davies.

SATURDAY 11 APRIL

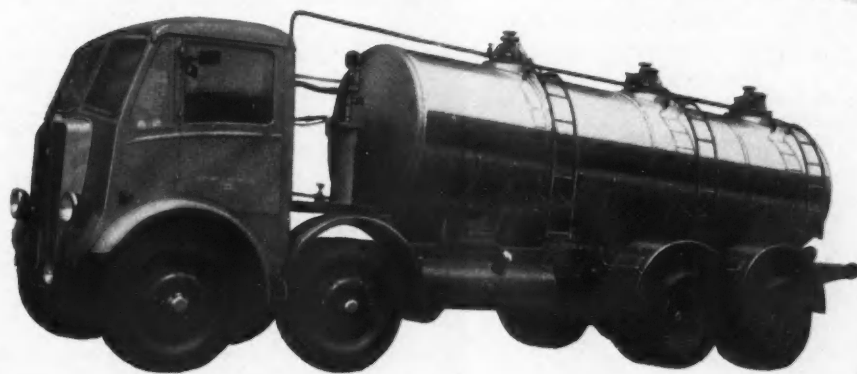
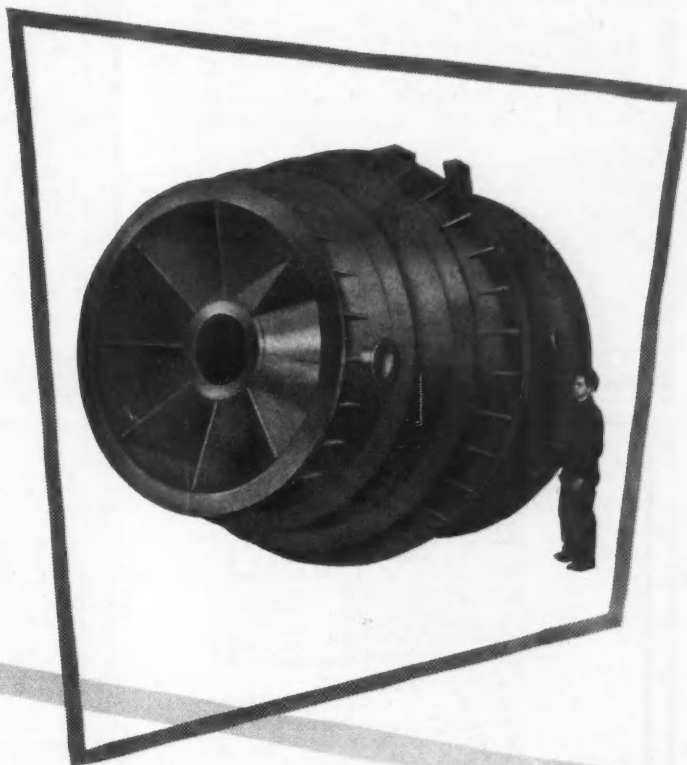
S.A.C.—Liverpool: City Laboratories, Mount Pleasant, 2.15 p.m. 'Training of analytical chemists', by G. F. Longman and J. W. Lucas.

Exemption from Import Duty

The Import Duties (Temporary Exemptions) (No. 3) Order, 1959 which temporarily exempts certain chemicals from import duty chargeable under the Import Duties Act, 1958, came into effect on 31 March and has been published as Statutory Instrument 521/1959. Exemption extends until 1 October 1959.

SPECIALISED FABRICATION

$\frac{1}{2}$ in. mild steel plate valve casing, weighing 4 tons; in two pieces, a cylinder and a cone; dia. 9ft. 7ins. tapering to 6ft. 2ins. by 10ft 4 $\frac{1}{2}$ ins. long.



One of three stainless steel road tanks, for transporting phosphoric acid; each tank has three compartments and is jacketed with aluminium.

These two examples are typical of the large range of fabricated constructions produced by Widnes Foundry & Engineering Co. Ltd., who offer a comprehensive service to industry, both in fabrication and foundry work.

WIDNES FOUNDRY & ENGINEERING CO. LTD.

ESTABLISHED 1841

APPROVED BY LLOYDS FOR CLASS II WELDING FOR PRESSURE VESSELS

LUGSDALE ROAD, WIDNES, LANCs.

PHONE: 2251/4 and 2889.

GRAMS: "FOUNDRY, WIDNES"

W

KEEBUSH

Keebush is an acid-resisting constructional material used for the construction of tanks, pumps, pipes, valves, fans, etc. It is completely inert to most commercial acids; is unaffected by temperatures up to 130°C; possesses a relatively high mechanical strength, and is unaffected by thermal shock. It is being used in most industries where acids are also being used. Write for particulars to—

KESTNER'S

5 Grosvenor Gardens, London, S.W.1



**LEIGH
& SONS
METAL
WORKS**
LTD.
Orlando
St., BOLTON

CARBOY HAMPERS

CARBOYS · PACKED CARBOYS
CARBOY FILTERS AND BARROWS
SAFETY CRATES TOP PROTECTORS

CROMIL & PIERCY LTD.



GRAPHITE
IN ALL FORMS

MILBURN HOUSE

"E" FLOOR

NEWCASTLE-ON-TYNE

Tel: 2-7761

The Jefco



FACE SCREEN

Reg. Design 751914 Patent applied for

Perfect protection when grinding or machining. Comfortable to wear, stands clear of the face, adjustable to any angle, non-splinter front easily renewable.

J. & E. FERRIS LTD

33 Museum St., London, W.C.1

Telephone: MUSeum 2876

"Fullersite"

SLATE FILLER

WHEREVER AN INERT FILLER
IS REQUIRED FULLERSITE
IS THE IDEAL MATERIAL

PENRHYN QUARRIES LTD.

PORT PENRHYN, BANGOR, NORTH WALES



FLAME TRAPS
TO OUR OWN
DESIGN AND SIZE
IN ANY METAL

RICHMOND WELDING COMPANY

ESTABLISHED 1929

RICHMOND ROAD, BRADFORD 7

TELEPHONE 25405

Classified Advertisements

CLASSIFIED RATES: All sections 5d. per word. Minimum 8/-. Three or more insertions 4d. per word. Box Number 2/- extra. Up to 10 a.m. Tuesday for insertion same week.
SEMI-DISPLAY: 30/- per inch. Three or more insertions 25/- per inch.
SUBSCRIPTION: Annual Subscription of 52/6 brings 52 weekly copies of **CHEMICAL AGE** direct to your address from the printer (postage paid by the publishers), and a copy of **CHEMICAL AGE DIRECTORY AND WHO'S WHO**.
COMPANY MEETINGS AND REPORTS: £12.12.0 per column. Three column measure (approximately 360 words).

FOR SALE

'Gwynne' all gunmetal centrifugal Pump 5 in. inlet and 3 in. outlet. 'Kestner' regulos metal vertical Pumps 2 in. inlet and outlet to give 80 gallons per minute at 25 ft. head or 40 gallons at 60 ft. head glandless type JPI with 4 h.p. flameproof motor 400/3/50. Keebush vertical glandless Pump to give 120 gallons per minute at 25 ft. head 2 in. inlet and outlet with 2 h.p. flameproof motors. Mather & Platt rubber lined Pumps 4 in. inlet 3 in. outlet to give 150 gallons per minute at 50 ft. head. Pulsometer rubber lined Pump 3 in. inlet and outlet to give 150 gallons per minute. Keebush Pump 5 in. inlet 3½ in. outlet. Kestner vertical stainless steel Pump 2 in. inlet and outlet 3 h.p. Motor. Pearns vertical 3-throw Pump to give 2,500 gallons per hour at 350 ft. head. Worthington Simpson 3-throw vertical Pump to give 18,000 gallons per hour at 250 ft. head. Haywood Tyler 3-throw vertical Pump to give 12,000 gallons per hour at 100 ft. head. Hick Hargraves Vacuum Pump to give 600 ft. per minute at 15 in. vacuum with 26 h.p. Motor. Kinney Vacuum Pump to give 45 ft. at 29 in. Vertical wet vacuum Pump cylinder 6 in. by 8 in. Pearns horizontal vacuum Pump single cylinder 6 in. by 8 in. Unused Ammonia Cracker. Broadbent unused Hydro Extractor with 36 in. lift out basket. Unused Air Compressors to give 14 ft. per minute at 3,500 lb. pressure. Several Condensers and Vacuum Receivers. Jacketed Autoclaves and Dryers from 30 in. dia. by 3 ft. long to 4 ft. 3 in. dia. by 7 ft. 6 in. long. Unused Meta Filters to give 3,000 gallons per hour. DARTNALL, 248 Humberstone Road, Plaistow, London, E.13

Unused Stainless Steel "Z" MIXER—21 in. by 21 in. by 20 in. Jacketed 50 lb. p.s.i. w.p. Glanded. With reduction gear. Unused Gardner 4 ft. dia. Double-Cone MIXER—20 cu. ft. 5 h.p. T.E. Motor and brake. Baker-Perkins 'Z' MIXER 53 in. by 43 in. by 32 in., Electric Tilting, 12½ H.P. A.C. Motor with Speed Reducer. Hobart 80-qt. (4-speed) and 30-qt. (3-speed) ELECTRIC CAKE MIXERS. REVOLVING DRUM MIXER—6 ft. by 2 ft. 4 in. wide. Stainless Steel 450-gal. F.M.B. TANK—5 ft. by 4 ft. New condition. Available March. Seite Aluminium FILTER PRESS, Beer type—4 chambers 15 in. square on wheeled trolley. Lying at our No. 2 Depot, Willow Tree Works, Swallowfield, Berkshire.

Apply:
WINKWORTH MACHINERY LTD.,
 65 HIGH STREET
 STAINES, MIDDLESEX.
 (Telephone 1010)

FOR SALE: continued

MORTON, SON AND WARD LIMITED

offer

STAINLESS STEEL VESSELS

One TANK 10 ft. by 2 ft. 6 in. dia. totally enclosed, suitable for 20 lb. p.s.i. w.p.
 One CRYSTALLIZING PAN 4 ft. dia. by 1 ft. 6 in. deep, detachable lid, with or without jacket.
 Several s.s. COILS from 2 ft. to 7 ft. dia.
 Assortment of s.s. VALVES, PLUG COCKS etc., from ½ in. to 3 in. Quantity of s.s. TUBING and s.s. FLANGES.
 All above second hand and in good condition.

NEW UNITS in stainless or mild steel made to requirements. CONDENSERS, MIXING VESSELS, JACKETED PANS with or without mixing gear. 'MORWARD' 'U' shaped TROUGH MIXERS with or without jackets. TANKS, CYLINDERS, RECEIVERS, PRESSURE VESSELS and AUTOCLAVES.

Stirring gear can be fitted to any vessels.
 New PORTABLE STIRRING UNITS with clamp-on attachment to requirements.

New MONO pumps and other second hand PUMPS in stock.

Enquiries invited:

MORTON, SON AND WARD LIMITED,
 DOBCROSS, OLDHAM,
 Lancs.

Phone Saddleworth 437

One—100-ton HYDRAULIC DOWNSTROKE PRESS, with double-acting hydraulic cylinder by Hydraulic Engineering Co. Ltd., Chester. 10½ in. piston, 10½ in. dia. ram × 15 in. stroke, 4 columns 3½ in. dia. set at 31½ in. × 21 in. centres. Tables 27½ in. × 31 in. fitted G.M. guide bushes.

One—MONORADIAL CONTROL VALVE, Type NPA.42.

One—New MONORADIAL HYDRAULIC PUMP UNIT, 2-stage type. E.V.25, capacity 7½ g.p.m. at 200 lb. p.s.i. and 1½ g.p.m. at 1½ tons p.s.i. Mounted on cast-iron bedplate and direct coupled to 3 h.p. Brook motor, 400/440 volts, 3-phase, 50 cycles, with 25-gallon supply tank.

One—WALL MOUNTING PUSH-BUTTON STARTER.

One—MAINS RELIEF VALVE MRSH/1.

One—No. 2 COMPOUND BALL TUBEMILL by Wm. Johnson & Son, complete with No. 3 cracker and all ancillary gear and motor.

Offers to the Chief Engineer, Robinson Brothers Ltd., Ryders Green, West Bromwich.

FOR SALE: continued

PHONE 98 STAINES

(12) S.S. (UNUSED) JACKETED PANS—20 in. by 17 in.
Glass-lined Tanks—800, 1,500 and 1,800 gal.
42 in. Electric Under-drive Hydro—440/3/50.
(9) 750-gal. S.S. Tanks—7 ft. by 3 ft. 3 in.
"JOHNSON" FILTER PRESS—48—36 in. sq. plates. Ditto,
24—25 in. sq. plates.
"Pair" Heavy "U"-Trough Mixers—5 ft. by 2 ft. 3 in. by 2 ft. 6 in.
10 h.p. A.C.
Tanks of all types up to 26,500 gallons.
Pumps, Autoclaves, Condensers, Ovens, etc.

Send for Lists.

HARRY H. GARDAM & CO. LTD.,
100 CHURCH STREET, STAINES.

600

CONTINUOUS HORIZ. GARDNER TYPE TROUGH MIXER,
25 ft. 6 in. by 5 ft. by 5 ft. 8 in. deep, $\frac{1}{2}$ in. welded M.S. plate
constr. Agitator shaft 24 in. dia. tube by 1 in. with 47 steel arms
set at 90° with bolted C.I. paddles 11 in. by 9 in. End discharge
with adjustable slide. Counterbalanced hinged aluminium covers
over mesh guards. Gear motorised 75 h.p. 415/3/50.

HORIZ. DOUBLE ACTING SINGLE CYLINDER VACUUM
PUMP by Worthington Simpson, 18 in. by 9 in. Cylinder, C.I.
constr. with compression rings. Mechanical lubrication from
drive shaft. Capacity 725 c.f.m. producing 28 in. vacuum. Motor
baseplate mounted on top of Pump.

'AUTOMILL' HIGH SPEED PULVERISER by British Jeffrey
Diamond. Tapered feed hopper discharging to 3 in. worm feeder
driven by $\frac{1}{2}$ h.p. geared Motor. Rotor fitted twelve swing hammers
and driven by 15 h.p. 400/3/50 cycles Motor. Mounted on single
bedplate. Feed size 1 in. max. outlet up to $\frac{1}{2}$ ton per hour when
reducing down to between 50 and 300 mesh.

SIX-CENTRIFUGAL EXTRACTORS by Broadbent, 36 in. dia.,
lift-out M.S. basket with $\frac{1}{2}$ in. perforations at $1\frac{1}{2}$ in. pitch. Three-
point suspension. Spring balanced lids with safety interlock and
hand brake. Underdriven by 12/13 h.p. Motor 400/3/50. Non-pit
type. Max. load 450 lb.

NEW WATER PRESSURE SAND FILTER, 1,500 g.p.h., 6 ft.
dia. by 4 ft. 3 in. deep on straight, 11 in. dished top and bottom.
Top dishing fitted 18 in. by 12 in. oval manway, mounted on four
short legs. Mild steel welded construction, 43 p.s.i.w.p. Capacity
approx. 1,000 gallons. Gauges, pipework and valves included.

UNUSED STAINLESS STEEL VAPOUR COLUMN, 17 $\frac{1}{2}$ in.
dia. by 20 ft. high in two sections 9 ft. 6 in. and 10 ft. 6 in. long,
 $\frac{1}{2}$ in. dia. perforated retaining plates and thermometer pockets
fitted at intervals. Charge of porcelain raschig rings included.
Top and bottom sections.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12.
Tel: Shepherds Bush 2070 and
Stanningley, Nr. Leeds,
Tel: Pudsey 2241.

EDUCATIONAL

A.M.I.CHEM.E.—More than one-third of the successful candi-
dates since 1944 have been trained by T.I.G.B. All seeking
quick promotion in the Chemical and Allied Industries should
send for the T.I.G.B. Prospectus. 100 pages of expert advice,
details of Guaranteed Home Study Courses for A.M.I.Chem.E.,
B.Sc.Eng., A.M.I.Mech.E., A.M.I.Prod.E., C. & G., etc., and a
wide range of Diploma Courses in most branches of Engineering.
Send for your copy today—FREE. T.I.G.B. (Dept. 84), 29
Wright's Lane, London, W.8.

OFFICIAL APPOINTMENTS

ENGINEERING AND CHEMICAL INSPECTORS; MINISTRY
OF LABOUR AND NATIONAL SERVICE. Pensionable
posts for men and women. Age: normally at least 35 and
under 40 on 1.3.59; extension for regular Forces service and
Overseas Civil Service. Duties include giving expert advice on
questions which arise from administering Factories Acts.
Qualifications: Corporate membership of appropriate profes-
sional Institution or, for Chemical Inspector posts, honours
degree (at least 2nd Class) in appropriate subjects. At least 2
years' relevant industrial or supervisory experience desirable.
Men's starting salary (London) from £1,325 (35) to £1,425.
Maximum £1,780. Promotion prospects. Write Civil Service
Commission, 17 North Audley Street, London, W.1, for
application form, quoting S4963/59. Closing date 8th May 1959.

RESEARCH FELLOWSHIPS (3 years) in GOVERNMENT
SCIENTIFIC ESTABLISHMENTS. Value £1,100-£1,350
(Senior) and £750-£1,000 (Junior). Very wide range of topics,
especially in the Physical Sciences. A few opportunities for
biologists, e.g., in Virology, Taxonomy and Physiology as
applied to fisheries and veterinary research. Qualifications:
Normally First or Second Class Honours Degree; evidence of
high standard of ability in research; and at least 2 years' post-
graduate research experience (3 years for Senior Fellowships).
No age limits. F.S.S.U. Write Civil Service Commission, 17
North Audley Street, London, W.1, for application form,
quoting S4932/59.

PATENTS & TRADE MARKS

KINGS PATENT AGENCY, LTD. (B. T. King, A.I.Mech.E.,
Patent Agent), 146a Queen Victoria Street, London, E.C.4.
City 6161. Booklet on request.

SITUATIONS VACANT

CHIEF WORKS CHEMIST required for Chemical Works in
the NORTH WEST OF ENGLAND. Experience in the
organic chemical field or oil industry desirable but not essential.
Write, giving details of age, education, training and experience to
Box CA. 418 c/o 191, Gresham House, E.C.2.

WANTED

WANTED

Phosphoric Acid. Supplies of waste acid required in Midlands
area. Any quantity considered, state full analysis. Reply to
Box No. 3656.

WORK WANTED & OFFERED

CRUSHING, GRINDING, MIXING AND DRYING for the trade
THE CRACK PULVERISING MILLS LTD.

Plantation House,
Mincing Lane,
London, E.C.2

High grade Corrosion Resistant Plastic Pipes and Fittings, Special
Fabrications, Mouldings and Plastic Valves. Expansion Units
and Thread Cutting Tools.

BARFLO

56, Cavendish Place, Eastbourne.
(Telephone 4046/7)

PULVERISING of every description of chemical and other
materials. Collections, storage, deliveries. THOMAS HILL-
JONES, LIMITED, INVICTA WORKS, BOW COMMON
LANE, LONDON, E.3. (TELEPHONE: EAST 3285.)

Chemical Age Enquiry Service

For fuller details of equipment, apparatus, chemicals etc., in the advertisement or editorial pages of Chemical Age, fill in the coupons below, ONE PER ENQUIRY, and return to us.

Please send further details about.....

.....

.....

mentioned on page.....of this issue.

Name..... Position.....

Firm.....

Address

.....

Chemical Age Enquiry Service.

Please send further details about.....

.....

.....

mentioned on page.....of this issue.

Name..... Position.....

Firm.....

Address

.....

Chemical Age Enquiry Service.

Please send further details about.....

.....

.....

mentioned on page.....of this issue.

Name..... Position.....

Firm.....

Address

.....

Chemical Age Enquiry Service.

★ *Detach this page complete then fold as marked
overleaf to use the post-paid reply folder*

Chemical Age

ENQUIRY SERVICE



*This is a special service for
readers of*

CHEMICAL AGE

*It is designed to give fuller
information on equipment,
apparatus, chemicals etc.,
mentioned in this issue—
whether in the editorial text
or in an advertisement*

*Cut out the whole of this page,
fold as instructed with post-
paid address on the outside*



Chemical Age

154 Fleet Street, London, E.C.4

Tel.: Fleet Street 3212

CUT ALONG THIS DOTTED LINE

2nd FOLD

Postage
will be
paid by
the
Licensee

No Postage
Stamp
necessary if
posted in
Great Britain
or
Northern Ireland

BUSINESS REPLY FOLDER
Licence No. 2501

CHEMICAL AGE
154-160 FLEET STREET
LONDON, E.C.4

3rd FOLD

1st FOLD

The Chemistry and Physics of Clays and Other Ceramic Materials

ALFRED B. SEARLE and REX W. GRIMSHAW

THE FOURTH AND ENTIRELY RE-WRITTEN edition of this standard work has just been published. The contents include chapters on:
The Nature of Clays and Other Ceramic Materials; Atomic and Crystalline Structure; Crystal Structure of the Silicates; The Crystal Structure of Non-Siliceous Ceramic Materials; The Identification and Estimation of Minerals in Ceramic Materials; The Chemical and Mineralogical Composition of Ceramic Raw Materials; Physical and Structural Properties of Raw Ceramic Materials; The Influence of Water in Ceramic Systems; Changes in the Physical State of Ceramic Materials Brought About by the Removal of Water; The Equilibrium State and Physico-Chemical Reactions; Chemical Changes in Ceramic Materials; Physical Changes in Ceramic Materials; Strength and Allied Properties; Miscellaneous Properties of Ceramic Materials.

Size: 9¼" × 6¼" Illustrated 944 pages 126s. net

Ernest Benn Limited

BOUVERIE HOUSE · FLEET STREET · LONDON · EC4

ABRASIVE POWDERS **. . . . ZIRCONIUM OXIDE & SALTS**

With 3,500 other commodity headings are listed with 10,000 suppliers of chemicals, chemical plant, equipment and instruments.

IN THE 1959 CHEMICAL AGE DIRECTORY AND WHO'S WHO NOW PUBLISHED—PLUS

3,000 Who's Who entries.

450 Trade Names.

Master Index of names, addresses with telephone, telex and cable information.

Principal chemical and allied organisations.

D.S.I.R. and research associations.

Agricultural research institutes.

PRICE £3.3.0

CHEMICAL AGE DIRECTORY & WHO'S WHO · BOUVERIE HOUSE · 154 FLEET STREET · LONDON E.C.4 · TEL: FLEET STREET 3212

**TO THE MANAGER
CHEMICAL AGE
DIRECTORY & WHO'S WHO**

**BOUVERIE HOUSE · 154 FLEET STREET
LONDON · E.C.4**

Please supply.....copies of your Directory at £3.3.0 per copy. Remittance will be made on receipt of invoice.

NAME

ADDRESS

SIGNED

DATE

**JMS****INORGANIC CHEMICALS****ANHYDROUS SODIUM
SULPHATE 99/100%****BLANC FIXE POWDER 98/100%****BARIUM CHLORIDE 98/100%****SODIUM CHLORATE 99/100%****SODIUM ACETATE 98/100%**

Write Dept. A/3 for full technical details.

J. M. STEEL & CO. LTD.**36-38 KINGSWAY, LONDON, W.C.2 Tel. HOLborn 2532/5**

Branch Offices:

51 SOUTH KING ST., MANCHESTER 2.	Tel. Deansgate 6077/9
45 NEWHALL ST., BIRMINGHAM 3.	Tel. Central 6342/3
144 ST. VINCENT ST., GLASGOW C.2.	Tel. Central 3262

